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~~NO. 1~~ VOL. 2

UNITED STATES NAVAL MEDICAL BULLETIN

FOR THE

INFORMATION OF THE MEDICAL DEPARTMENT OF THE SERVICE

LIMITED TO PROFESSIONAL MATTERS AS OBSERVED BY MEDICAL OFFICERS AT STATIONS AND ON BOARD SHIPS IN EVERY PART OF THE WORLD, AND PERTAINING TO THE PHYSICAL WELFARE OF THE NAVAL PERSONNEL

~~JANUARY~~, 1908

(ISSUED QUARTERLY)

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NAVY DEPARTMENT,
Washington, March 20, 1907.

This United States Naval Medical Bulletin is published by direction of the Department for the timely information of the Medical and Hospital Corps of the Navy.

TRUMAN H. NEWBERRY,
Acting Secretary.

20025

PREFACE.

The publication and issue of a quarterly bulletin by the Bureau of Medicine and Surgery contemplates the timely distribution of such information as is deemed of value to the medical officers and the hospital corps in the performance of their duties, and with the ultimate object that both shall continue to advance in proficiency in respect to all of their responsibilities.

It is proposed that the Naval Medical Bulletin shall embody matters relating to hygiene, tropical and preventive medicine, pathology, laboratory suggestions, advanced therapeutics, surgery, medical department organization for battle, new methods of treatment, and all other matters of more or less professional interest and importance under the conditions peculiar to the service and pertaining to the physical welfare of the naval personnel.

It is believed that the corps as a whole should profit, to the good of the service, out of the experience and observations of the individual. There are many excellent special reports and notes beyond the scope of my annual report being sent in from stations and ships, and by communicating the information they contain (either in their entirety or in part, as extracts) throughout the service, not only will they be employed to some purposes as merited, but all medical officers will thus be brought into closer professional intercourse and be offered a means to keep abreast of the times.

Special attention will be given by the instructors of the Naval Medical School to the review of advances in medical science of special professional interest to the service, as published in foreign and home journals, and extracts from these will appear in the bulletin, together with such remarks as the instructors may deem of value to officers on foreign service or sea duty.

Information received from all sources will be used, and the Bureau extends an invitation to medical officers to prepare and forward, with a view to publication, matter on subjects relating to the profession in any of its allied branches.

P. M. Rixey,
Surgeon-General, U. S. Navy.

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SPECIAL ARTICLES.

A PRELIMINARY REPORT ON GANGOSA AND ALLIED DISEASES IN GUAM.

By Passed Asst. Surg. A. J. Geiger, U. S. Navy.

In submitting this paper Doctor Geiger wishes to be understood as acting in accordance with his views of expediency in the matter. He feels that the work done and observations made up to this time warrant an announcement, though his studies have not been completed.

He says that since writing the report investigation seems to show that B. gangosæ and B. diphtheriæ may be differentiated by cultural means. The organism has also been found in chronic recurring ulcers other than those of the nose and throat, so that it may apparently occur on any portion of the body, and its recurrence can readily be explained by the fact brought out in the report, namely, that healing may take place, leaving the organism (temporarily quiescent) embedded under the epithelium to again become active and produce ulceration.

He says further that a large number of "suspects" have now been examined for reclusion, the diagnosis to this end being based entirely upon the bacteriological findings, and that in every case this action has been justified by subsequent clinical developments. Doctor Geiger believes it will be found that the disease is much more widespread over the island than has been thought.

Ulcerations of the upper portion of the respiratory tract are quite common among the native population of Guam. These ulcerations may be divided into three groups, viz:

Group 1. Ulcerations which Yield Readily to Antiseptic Treatment.

This group includes all ulcerations due to the ordinary pus organisms. By far the most common cause of these ulcerations is the Bacillus pyocyaneus. (In fact, this organism is very common in Guam. I have many times found it in the stools of infants with diarrhea and in the sputum of cases with bronchitis.) I have found quite extensive ulcerations of the nose due to this organism. The ulceration yields readily to treatment with ordinary antiseptics, and it is not very likely to recur. In one case ulceration in one nostril was later followed by a similar ulceration in the other nostril, but this can hardly be considered a recurrence.

GROUP 2. ULCERATIONS WHICH YIELD SLOWLY TO ANTISEPTIC TREATMENT.

To this group belongs a large percentage of the cases, and it is to this group that the term gangosa should be limited. The ulceration starts at some point in the nose or throat and spreads rather slowly, sparing neither cartilage nor bone. In many of these cases one finds the vomer, the turbinates, and portions of the ethmoid, sphenoid, and superior maxillary destroyed, leaving a more or less honeycombed surface, due to the breaking down of the cavities in these bones. The ulceration is always continuous. Various points of ulceration with unaffected tissue between them have not been observed. The infective agent probably always proceeds over the surface and is never carried by the blood or lymph. The eyes are quite commonly affected, producing a severe conjunctivitis and keratitis. The eyes become thus infected probably either by direct extension through the nasal duct or by the patient conveying the infection to the eyes with infected hands or handkerchiefs.

The following organism has been found present in all the active cases. It is believed to be the etiological factor and direct cause of the disease, and therefore it has been called *Bacillus gangosæ*, and may be characterized as follows:

Morphology.—A straight or slightly curved slender rod with rounded ends from 3 to 5 microns long. It is not motile and spore formation has not been observed. Short branching forms have been found. The organisms in specimens are often arranged parallel to each other or have a V-shaped arrangement.

Staining properties.—It stains well with all the ordinary dyes and by Gram's method. By growing the organism on Loffler's blood serum for twenty-four hours and staining specimens with Neisser's stain, or Loffler's methylene blue, or a weak solution of carbol-fuchsin or carbol-fuchsin full strength and afterwards decolorized with alcohol, very characteristic granules are observed in the bodies of the bacilli. There may be only one, most frequently two, and sometimes more, granules in each organism. In shape the granules are oval, round, or lanceolate. If only one is present, it is located in the center of the cell and is generally nearly twice as long as it is thick. If there are two granules present, one is located near either end, the granules being more nearly round than those in organisms having only one granule. If there are more than two granules, they are distributed at equal distances throughout the bacillus. These granules are often found when the organism is grown on other media, but usually they are most characteristic when grown on Loffler's blood serum.

Culture characteristics.—The organism grows best in the presence of oxygen, but grows also to a limited extent in the absence of oxy-

PHOTOMICROGRAPH OF BACILLUS GANGOSÆ (PURE CULTURE) × 2,000. STAINED WITH FORMOL FUCHSIN.

gen, and is consequently a facultative anaerobe. It grows best at body temperature and only very slowly at 20° C. On blood serum in twenty-four hours it forms small, round, grayish-white colonies slightly raised above the surface of the medium. Liquefaction of the medium does not take place.

On nutrient agar in twenty-four hours surface colonies appear, which are grayish white, round, and slightly raised above the surface. With the low power the outer portions of the colony appear coarsely granular and the border regular. The deep colonies remain small and with the low power appear uniformly opaque. The general contour is regular, round, or oval.

On gelatin in two or three days it produces very small white colonies. In a gelatin stab small white colonies appear along the line of inoculation. The medium is not liquefied.

In bouillon the growth is very slight, so that the growth can hardly be noticed for the first two or three days, when a slight flocculent growth may be noted at the bottom. If by chance some of the organisms remain on the surface when the tube is inoculated and it remains undisturbed, a gray film will grow over the surface, but if disturbed it settles to the bottom.

Litmus milk remains unchanged.

On potato culture the growth is slight and quite invisible.

It does not ferment glucose or lactose.

Pathogenesis.—Inoculated into the nose of a gray rat, after four or five days a distinct conjunctivitis appeared in both eyes. The nose could not be examined satisfactorily.

Reasons for believing that the organism described is the etiological factor and direct cause of the disease:

1. The organism has been found in every case examined in which the disease was still active.

2. In acute cases, where the conjunctivæ are involved by extension of the disease, the organisms are generally found in pure culture in the conjunctival sac.

3. If a case with extensive ulceration be treated for several days with antiseptics, a large portion of the ulcerating surface will present healthy granulations and begin to heal. Small areas, however, will often be found which continue actively ulcerating. In many instances bone destruction will be going on at these points. The organisms can invariably be found at these points until all active ulceration ceases.

4. Healing sometimes proceeds over an ulcerating surface, leaving here and there a wart-like projection. After an interval of time this breaks down, leaving a very small ulcer. If just before it breaks down completely the surface is removed with aseptic precautions, the

organism is found in pure culture in the pus thus obtained. Sections from these wart-like projections often reveal the organisms in groups just beneath the epithelium.

5. The organism has never been found in any other condition.

Pathological anatomy.—A section through the ulcer shows a simple ulcerating granulation tissue. Often there are columns of epithelium growing down into the tissue. Sometimes portions of these columns become entirely separated and form nests of epithelial cells somewhat resembling those of epithelioma. These can not be regarded as malignant, however, but rather as an attempt at repair.

Remarks.—The organism described above very closely resembles the *Bacillus diphtheria*, and it is doubtful if it can be distinguished from this organism by cultural means. Even the pathological lesions produced by *Bacillus diphtheriæ* vary so greatly that it seems difficult to distinguish between the two organisms by the lesions produced. The destruction of tissue is much greater in cases of gangosa than in diphtheria. The constitutional symptoms are seldom present. Mink and McLean (Journal A. M. A., October 13, 1906), describe a fulminating type of the disease in children under 5 years of age. These, they state, resemble diphtheria closely, but that cultures from the throat were negative for Klebs-Loffler bacilli.

So far as can be ascertained, only two cases of diphtheria have occurred on the island and both of these in Americans. In one of the cases it was stated specifically that the Klebs-Loffler bacillus had been found. It might be considered that the natives have acquired immunity to the toxins, and therefore the only effect that it would have upon them at present is local ulceration. It is a well known fact that the *Bacillus diphtheriæ* has often been found on the membranes of the upper respiratory passages in Caucasians who were in good health.

GROUP 3. ULCERATIONS WHICH ARE ONLY MODIFIED BY ANTISEPTIC TREATMENT.

This group is characterized by the formation of distinct tubercles or nodules which may involve the skin or mucous membrane of the nose, soft palate, pharynx, larynx, or lips. Immediately preceding the outbreak of the tubercles there is a general inflammatory condition of the skin or mucous membrane involved. After the tubercles have made their appearance the inflammation subsides somewhat, but takes on a more chronic character, and a hyperplasia of the tissue surrounding the tubercles takes place. This continues until there is a distinct tumor formation of ivory-like hardness. Several of the original tubercles are usually included in this tumor mass. The tumor sooner or later breaks down, leaving a sloughing ulcer, the size of which depends upon the size of the tumor. Sloughing continues until all of the involved tissue has sloughed away,

after which it heals quite rapidly. As the deep tissues are often involved when there is no superficial ulceration, and often quite distant points become affected, it is believed that the infective agent is carried by the lymph.

The following organism is constantly associated with the disease and is believed to be the etiological factor and direct cause of the disease:

Morphology.—A bacillus with rounded ends about 0.6 micron long and about 0.5 micron thick. On artificial media, however, the size varies greatly. Sometimes it is very little longer than it is thick and occasionally it grows to considerable length (4 to 6 microns). In the tissue it is generally surrounded by a capsule. On artificial media the capsule may sometimes be found. Spore formation has not been observed.

Staining properties.—It stains well with all of the ordinary dyes, but not by Gram's method. To demonstrate the presence of the capsule, one of the capsule stains must be employed.

Culture characteristics.—It grows best at body temperature, but also grows very well at 20° C. It grows best in the presence of oxygen, but it also grows well in the absence of oxygen, so it is a facultative anærobe. On blood serum it forms grayish-white colonies in twenty-four hours. The colonies are round and slightly raised above the surface. The medium is not liquefied.

On nutrient agar in twenty-four hours it forms large, round, grayish-white colonies. Viewed with the low power, the center of the colony is quite homogeneous, while near the border it is rather coarsely granular. The border may be smooth or slightly undulating.

On nutrient gelatin in twenty-four hours it forms small, round, grayish-white colonies. In gelatin stab culture growth occurs along the entire line, but most rapidly at the surface, where it may be considerably raised above the surface, forming the characteristic "nail" growth. Gas bubbles often form along the line of inoculation. The medium is not liquefied.

In bouillon a general cloudiness is produced in twenty-four hours. After a few days a finely granular sediment is deposited on the bottom.

On potato culture a copious gray growth is obtained in twenty-four hours. The growth is considerably raised above the surface of the medium.

Litmus milk in twenty-four hours becomes acid and coagulates.

It does not reduce a weak solution of methylene blue.

It ferments glucose and lactose. (No other sugars were tested.)

Pathogenesis.—Inoculation of the conjunctival sac of a gray rat produced in four or five days a distinct conjunctivitis. A gray rat

FIG. 2B.—(GOLDTHWAIT). ENCROACHMENT ON INTERVERTEBRAL FORAMINA.

FIG. 2A.—(GOLDTHWAIT). NODULAR OSSIFICATION OF INTERVERTEBRAL DISKS; ABSORPTION OF DISKS; CHARACTERISTIC "BOWING."

exclusively one of our race or era or even of the human species. Specimens illustrating this affection have been found in Egyptian mummies, in skeletons of prehistoric American cliff dwellers, and cases have been reported in several domestic animals.

Goldthwait and his associates have been carrying on for some years experimental researches in the metabolism of these cases, and it is hoped that these investigations, if not immediately productive, will at least suggest methods of future study.

PATHOLOGY.

The cases occurring in animals have been very few as far as is known, and they were not studied. There is no means of provoking the disease experimentally in animals. The disease, if it has ever been the direct cause of death, in such case escaped recognition. The affection has been appreciated only within recent years, previously to 1899 but 35 cases having been reported. Moreover, it is of such character and location that it does not lend itself readily to surgical exploration. Hence it is easily understood why pathological knowledge of the disease is meager, and what little we possess is derived inferentially from the study of clinical symptoms, from specimens obtained incidentally which exhibit the end results of the process, and from radiograms.

This form of disease has commonly been confused with atrophic arthritis, which is chronic in character and also terminates in rigidity of the spine, but which, contrary to what occurs in hypertrophic arthritis, shows atrophy of all the joint structures with no tendency to nodular growth or osseous deposit.

Certain infections may be accompanied or followed by involvement of the spine not essentially different from infectious arthritis as seen in other joints, and this type also has not always been differentiated; hence has arisen the poor definition of former clinical pictures of this class of diseases.

Hypertropic arthritis, a distinct entity, consists of a nodular enlargement of the edges of the articular cartilages; this proliferation subsequently ossifies and the ossification extends into neighboring fibrous or ligamentous structures. (Fig. 1, 2a.) The bones are not markedly altered in structure. The intervertebral disks may be absorbed and the curved, inflexible spine (figs. 2 and 12), so commonly seen in elderly persons, then results. Anchylosis of the spine, from a rapid ossification, may fix the column before absorption of the cartilages can take place. Fusion of vertebræ eventually occurs, but the rigid spine is erect. In joints, such as the knee, where motion is free, fusion may be delayed and the bare surfaces of bone become polished and dense from attrition. In these cases also, however, the

bare bone is slowly worn away at the points of contact, the edges hypertrophy, and the joint mobility becomes progressive more limited by the elevated ridges until all motion is lost and anchylosis is complete.

The process in the spine, except in the cervical region, always begins upon one side anteriorly and extends up and down along the anterior lateral ligament. (Fig. 1.) It may remain localized or may cross over and both sides become ossified.

Less commonly the posterior ligaments and articulations are invaded, and it is in this class of cases especially that we find nerve involvement brought about by narrowing of the foramina. (Fig. 2b.)

The costo-vertebral articulations may be involved also (case No. 15) and all motion of ribs be lost. Such cases of thoracic fixation are predisposed to tubercular infection.

SYMPTOMS.

The four striking symptoms on which a diagnosis is made are pain, limitation of motion, muscular contractions, and referred pains. These may not all be present, or the disease may progress so slowly that the subjective signs may escape the patient's notice. Again, it is not uncommon for an incidental referred pain to absorb the whole attention of both patient and physician. (Case No. 11.)

Pain.—The pain of the disease, as distinguished from referred pain, is localized generally near the site of the lesion either in the back or deep in the abdomen. This pain may be of any degree of severity or may be absent altogether. When the pain is referred to the back the patient describes it as lumbago. (Case No. 12.)

The anterior spinal pain is the more severe, and usually occurs in paroxysms. In case No. 13 the paroxysms were unusual, and the method adopted by the patient for their relief was so unique that several diagnoses were reviewed carefully.

Since this paroxysmal pain is more common when the site of disease is in the lower dorsal or lumbar regions and at night, it is probable that the relaxation of muscles during sleep permits the hitherto guarded spine to sag. The crowding together of the diseased vertebræ sets up violent muscular contractions which give rise to the pain. Lending further plausibility to this supposition is the fact that these crises can be prevented by any measure which maintains the normal spinal curves.

The *referred pains* are due to pressure of the thickened tissues on the spinal nerve roots. Since the disease is always more marked on one side, these pains are correspondingly unilateral. If, as may happen, they are sometimes present on both sides, the pain is much more severe on one side, or the maximum of pain is not synchronous, but

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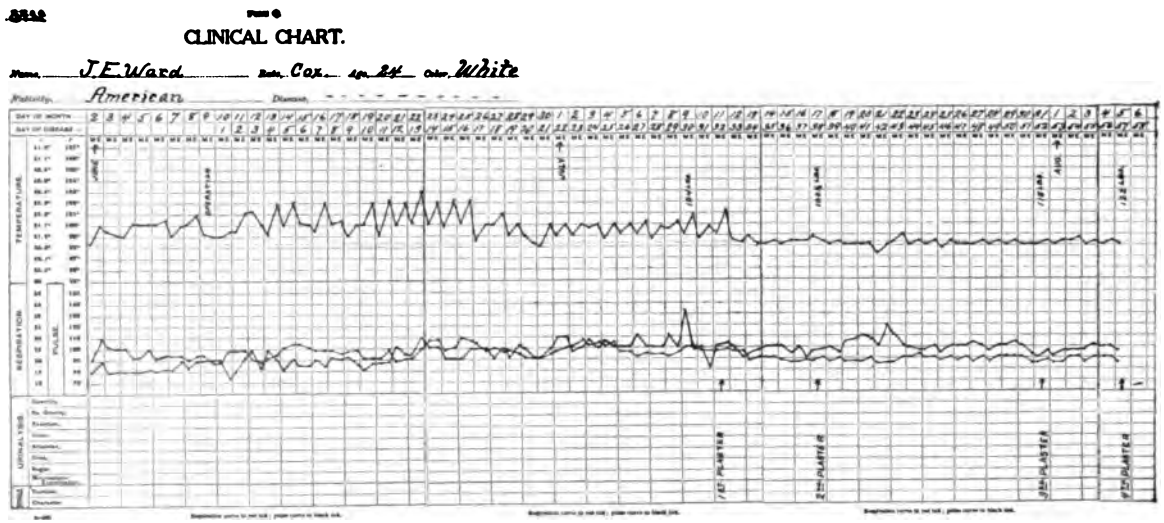

FIG. 6.—CHART IN CASE 11.

Arrows show dates on which plaster was renewed. The rapid gain in weight made renewal unusually frequent.

the side secondarily affected represents a further and later extension of the disease, as mentioned in the paragraphs on "Pathology."

This referred pain is always located in the area of distribution of the nerves and is not felt along their course. The location of pain naturally will vary according to the seat of the disease and the nerves affected. As is well known in cases of pressure from other causes, degrees of pressure on sensory nerves cause hyperesthesia, paresthesia, or total anesthesia, and similarly increased irritability, paresis, or paralysis may be found in the motor nerves. (See abstract of case histories.)

This pressure is probably due to inflammatory exudate and not bony hyperplasia, since relief follows almost immediately on efficient fixation.

Certain motions may render acute a latent pain. The reason is obvious, and such a history (case No. 16) should always lead to examination of the spine. The chief complaint in case No. 14 was his inability to sleep in a hammock. A hard, flat surface was necessary for his rest. Sharp pains frequently recur when a support is first removed and spinal sagging occurs before the muscles resume their guarding spasm.

I need not refer to the importance of recognizing such referred pains. An examination of the spine will clear up many cases of obscure pains in the abdomen and chest, most cases of sciatica and lumbago, and prevent many humiliating mistakes in diagnosis. Case No. 11 underwent an appendicectomy for such referred pain.

Limitation of motion.—As in other diseases of joints, limitation of motion is a very valuable sign and, next to pain, the most common. The late rigidity dependent on osseous anchylosis is permanent; the early muscular spasm rapidly disappears under treatment or in any case as the process subsides.

The limitation of motion is made evident by forward, backward, and side bending. Hyperextension of the thighs and spine puts great strain on all parts of the spinal column and will rarely be performed. Forward bending is generally accompanied by spasm and pain, especially marked in the region of the disease. Lateral bending not only shows the presence of a lesion, but also quite accurately delimits its extent and indicates the affected side. Any motion which puts the affected structures *on the stretch* is the most painful. Reference to the accompanying photographs will make this clear. (Figs. 3, 4, 5, 9, 10.)

The *deformities* are not peculiar and are what might be expected. The bodies of the vertebræ are not affected (unlike Pott's disease), and the final deformity is therefore a bowing and not an angle. (Figs. 2a, 12.) Various degrees of lateral curvature and scoliosis

may be met. Other joints may be coincidently affected and influence both symptoms and ensuing deformity. The sacro-iliac joints are commonly involved by the extension of a lumbar arthritis. (Case No. 12.) A very acute process may produce anchylosis before absorption of cartilage can bring about kyphosis; the spine, although rigid, is then erect.

The attitudes and spasms of early disease are less properly described as deformities since they are due to muscular contracture and are relieved by treatment or disappear spontaneously with the regression of the disease. Lateral curvature of varying degree is usually present (see case No. 11) and spastic conditions may result in faulty attitudes and limps, either unconscious or due to efforts to gain ease. For the reasons already mentioned these symptoms also are more marked on one side. Case No. 13 (fig. 11) is an excellent example of psoas contraction more extreme on the right side. Cases No. 15 and No. 16 exhibited a forward bowing of the upper dorsal region while the disease was situated in the lower dorsal vertebræ. Patients state that the attitude is caused by the pain incidental to maintaining an erect position.

Some cases, possibly of unrecognized infectious nature, exhibit fever, rapid loss of weight, and leucocytosis in the early stages. (See No. 11.)

DIAGNOSIS.

In most cases an inspection of the back, with consideration of the symptoms, will suffice for diagnosis. Certain diseases may need careful differentiation.

Atrophic arthritis was formerly described by writers, together with hypertrophic arthritis, under the name of Arthritis deformans. Confusion has naturally arisen. In the atrophic form there is atrophy of all the joint structures leading to anchylosis and deformity, but nodular overgrowth and osseous deposit are absent. The process is chronic from the beginning, and hence the muscular spasms and the referred pains of the acute stage of the hypertrophic form are lacking.

Pott's disease, involving, as it does, the bodies of one or more vertebræ, produces an angular deformity. The nervous symptoms, if such exist, are central in type and not peripheral. There is not the characteristic overgrowth, and the X ray may differentiate. The tuberculin, opsonic, and other tests may be applied.

Infectious arthritis may occur in the spine as elsewhere. The antecedent disease may usually be inferred, and the symptoms—sudden onset, fever, rapid pulse, glandular enlargement, leucocytosis, possible endocarditis, or other vesceral lesion—are characteristic.

FIG. 7.—A FORM OF SUPPORT DURING APPLICATION OF JACKET.

FIG. 8.—CASE 11. JACKET AS APPLIED.

TREATMENT.

The general condition of the patient should receive careful attention. Assuming the possibility that some form of auto-intoxication exists, this should be sought for and corrected if found. In two cases I have seen striking results follow treatment directed toward an old intestinal infection with amebæ and flagellates, which had been present without direct symptoms. Anæmia and loss of weight are often evident.

Large quantities of water are of decided benefit. Drugs should be used with intelligence. They are to be employed only for a definite end and must be free from side actions injurious to digestion, since it is most important that the general condition be kept at the highest level. Food should be generally plain and nutritious, and selected without restriction as to class. It is well in all cases to prevent sagging of the bed by placing boards transversely on the bed frame underneath the spring and mattress.

The local treatment consists in fixation of the spine. This is best accomplished by the plaster-of-Paris jacket (see fig. 8), which can be accurately fitted and is efficient in preventing motion.

No forcible effort to correct deformity should be attempted. As the disease regresses a progressively better posture is assumed naturally, and any violent methods of overcoming contractures result in severe exacerbation of all symptoms. A simple apparatus to maintain a good attitude without weariness and relaxation into a bad position is of value. (See fig. 7.)

After a thorough bath the trunk is powdered and swathed in sheet wadding or flannel. The wadding is elastic, not easily permeable to water, and thin. It is preferable to any other similar material. The sacrum and iliac crests must be carefully protected. The plaster bandages are then applied in the usual fashion, beginning at the level of the pubes and trochanters and working upward. This procedure prevents a downward slipping or collapse of the plaster while it is still soft with the resulting undue pressure on the crests. The lower border will have an obliquity corresponding to that of the pelvis. The points in a jacket most apt to be weak are about the pelvis and over the epigastrium.

A light (3-lb.) but strong support may be secured by using enough plaster bandages to obtain a quickly setting basis and then building up until the required strength is attained with bandages wet with silicate of soda, dextrin, etc. Ordinary gauze bandages may be used and the solution applied with a brush as the bandages are laid. A useful dextrin-silicate formula is as follows (Gallagher):

Powd. starch, oz. 4; sod. silicate soln., gal. 1. Mix; let ferment three days. At end of that time heat to boiling. Soften 4 oz. of gela-

Pain is on left side. Note marks of actual cautery.

tin in cold water and dissolve in the minimum quantity of boiling water; add while hot to the hot starch silicate. Finally add boric acid, ozs. 2, rubbed into a paste. If too thick, this may be diluted with boiling water. The fermentation is allowed for the change of the starch to dextrin. These "compound" jackets are much more durable and may be removed for purposes of cleanliness. Certain cases suffer from muscular cramps for a few days after the application of a support. These pains subside spontaneously as the results of fixation are brought about, but they may be relieved immediately by the momentary loosening of a cut jacket and a brief change of attitude. While it may be fairly stated that if pains persist fixation is not perfect, yet certain cases have periodical or slight recurrences of pain when no fault can be discovered in the support. Applications of dry heat until the skin is well reddened and covering the area of pain with flannel are very grateful to a patient.

A plaster can not be extended downward so as to fix the pelvis if the case is to remain ambulatory. Where the sacro-iliac joints are coincidently affected a web strap about the pelvis will efficiently supplement the jacket.

When the process becomes subacute (or from the beginning in mild cases) lighter supports of leather, dextrin, or reenforced webbing may be used. In general a support of some description is necessary for one to four months. A cure is evidenced by the absence of subjective symptoms and the return of painless flexibility in the spine. If bony anchylosis is permitted to occur a rigid spine is inevitable.

The irksome and debilitating effects of fixation may be attenuated by judicious bathing, massage, and breathing exercises (when the costo-vertebral articulations are not acutely involved).

ABSTRACTS OF SIX CLINICAL HISTORIES.

Case No. 11.—J. E. W.; seaman, U. S. Navy; 24 years; admitted June 2, 1907, with "appendicitis."

Three days prior to admission he complained of a constant pain in right iliac fossa. Temperature varied from 98.8 to 101° F. There was no muscular rigidity, and deep palpation caused little distress. In the hospital the temperature showed the same excursion, with periods of pain and tenderness in right iliac fossa.

The urine was practically normal. Leucocytes were 8,700 on June 4 and 11,000 on June 7.

Appendicectomy was performed on June 9.

After operation patient's condition was unchanged; tenderness and pain persisted precisely as before. Temperature, 100 to 102° F; pulse, 85–95; respiration, 20–26. No signs in lungs; wound clean; nothing

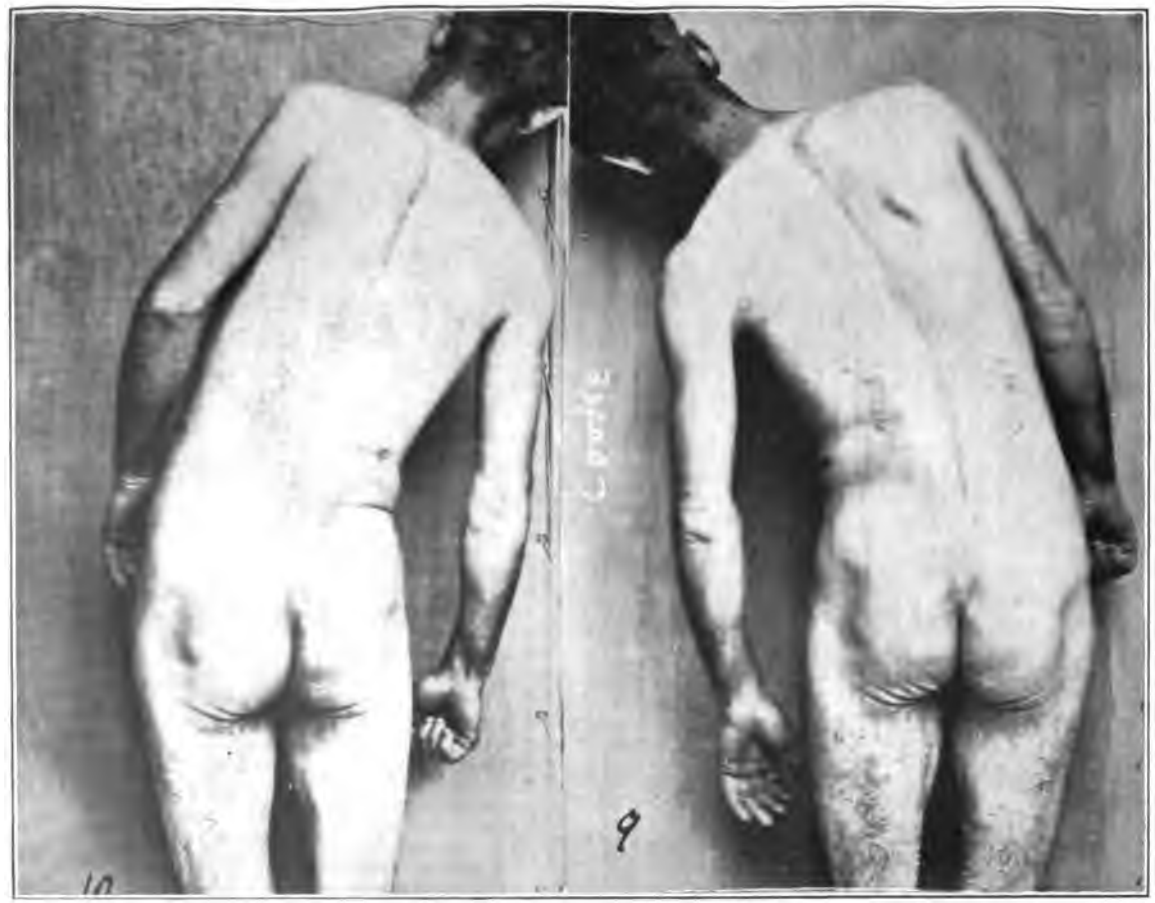

FIG. 9-10.—LATERAL BENDING IN CASE NO. 14.

Pain is on left side. Note marks of actual cautery.

FIG. 11.—CASE NO. 13.

Best attitude. Shows psoas contraction more marked on right.

palpable; bowels moving. Feces contained mucus and fatty crystals, but no parasites.

June 13: Leucocytes, 17,000. Widal reaction negative.

June 17: Some tenderness in flank and right abdomen.

June 20: Tenderness more general, but bowels were moving and there was no spasm. Leucocytes, 23,000; urine normal; feces negative. Widal reaction negative.

June 27: Leucocytes, 20,000.

July 5: A marked lateral curvature of the spine was noticed in lower dorsal region with convexity to the left. Movements of spine were limited, but fairly free, except bending to the left; then spine simply straightened and was held rigid. (See figs. 3, 4, 5.)

July 11: Plaster jacket applied from axillæ to trochanters.

On the day the plaster was applied patient weighed 104 pounds and his temperature rose to 101° F. The following day his temperature became normal and remained so. He rapidly gained weight and strength, and on August 21, six weeks after application of jacket, his weight was normal and all symptoms had disappeared. (See temperature chart.)

He was discharged to duty on October 9 with a leather jacket.

Case No. 12.—H.; lieutenant-commander, U. S. Navy.

"Lumbago" for several years. On examination lumbar spine showed considerable lordosis and was completely rigid. Sacro-iliac joint also affected. Pain was localized in left spinal region and over left sacro-iliac synchondrosis and was referred to changing points between knee and ankle in distribution of left sciatic nerve.

Treatment was carried out with a corset and pelvic strapping. Entire relief of all pain came gradually and considerable flexibility returned in spine.

Case No. 13.—J. L.; coxswain, U. S. Navy.

Heavy blow on lumbo-dorsal spine on June 26, 1906. Pain appeared in injured area in December, 1906, and early in January, 1907, he noticed that he was acquiring a permanent bend at the hips. (Fig. 11.) All kinds of exercises and passive motions were tried, but they increased the pain and deformity.

Pain was intermittent, located in right side about opposite site of eleventh dorsal to second lumbar vertebræ, and extended to front of abdomen. Slight pain was present on left side also. Psoas muscle was contracted so that movement was painful and complete extension impossible, but muscle relaxed entirely under chloroform.

The pains were partly relieved by certain peculiar motions calculated to relieve muscular spasm.

A jacket was not applied until eight months after symptoms appeared, but is now being worn with marked progressive improvement.

Case No. 14.—W. H. C.; seaman, U. S. Navy.

Five months before admission he found that lying in his hammock was very painful and that a hard, flat surface was necessary for his rest. Pain was principally on left side. No referred pains present. Movement of spine showed disease to be located in a site corresponding to area of pain. (See figs. 9, 10.) A jacket has given him entire freedom from symptoms.

Case No. 15.—J. H. B.; private, U. S. M. C.

Symptoms are of recent date. He complains of pains in body on moving after a period of lying or sitting. If he sits long in one position, he has to hold himself up by the arms to "relieve the spine of the body weight." Pain is worst when he gets out of bed in the morning, but during the night also he has to get up and, by "lifting" himself, relieve the pain. The general distribution of the pain is the left lumbar region, but on coughing or breathing deeply pain is felt along left costal border. Violent movements of any kind increase the pain greatly, and any movement except the most guarded and gentle provokes some pain. Left leg always goes to sleep if he sits in one position long. Recently there has appeared marked bowing of the upper thoracic spine (fig. 12), with flattening of the chest and diminished expansion. Sacro-iliac joints apparently normal. Hyperextension: Of right leg, normal; left leg, limited by pain and spasm; of lumbar spine, instantly arrested by a forcible anterior bowing—"bucking." Sitting: Motions same as standing. Standing and bending: To left, spine slightly curved; to right, spine rigid and straight (11th D. to 4th L.); backward, none; forward, slight, with pain in region of first and second lumbar vertebræ. This case illustrates the symptoms present when the thoracic spine and costovertebral articulations are affected.

Case No. 16.—J. C. M.; 23; S. C., 4th class.

Gonorrhea and syphilis, August, 1906.

Confined to bed in November, 1906, with a multiple gonorrheal arthritis, and about this time there appeared the pain in the right flank and abdomen between the costal border and the iliac crests. He gradually improved and was free from pain during June and July, 1907. In August, 1907, a recurrence of the multiple arthritis came on, and in November the pain in the side returned and has been growing worse. At present one ankle is the only joint affected.

Pain is situated in flank as before. There is always some dull pain, made sharp and severe by any motion, as lifting, sweeping, relaxing himself in bed, or quick breathing. He does not sleep at night because of pain, to relieve which he has to prop himself up in certain ways. He has noticed of late that any movement while in bed, such as rolling over, causes a sharp pain in right thigh.

FIG. 12.—CASES 15 AND 16. BOWING OF THORACIC DISEASE.

When standing he always leans forward on a support with both arms to relieve pain. There is forward bowing of upper dorsal region caused by the pain of any effort to maintain an erect position; this is of recent origin. There is no tenderness corresponding to the area of pain. Abdominal examination negative.

Forward bending: Slow and moderately painful in flank; fairly complete. Backward bending: No spasm. Right-left bending: Spine rigid and straight from eighth dorsal to first lumbar vertebra, corresponding to distribution of pain.

This appears to be the one case in which gonorrhea might well be the supposed causal factor.

BERI-BERI AT THE U. S. NAVAL HOSPITAL, NORFOLK, VA.

By Surg. R. C. Holcomb, U. S. Navy.

During the visit of the Brazilian warships to the Jamestown Exposition, beri-beri broke out aboard one of the ships, and the cases were sent to the U. S. Naval Hospital, Norfolk, Va., for treatment. Of the three ships, one of them went to New York shortly after arrival and the other two, the *Riachuelo* and *Barroso*, remained off Norfolk during a period of about two months. All of the cases of beri-beri, some 20 in number, came from the cruiser *Barroso* during the period from June 9 to July 27, at which latter date the ships left port.

BERI-BERI IN BRAZIL.

Much of the present day interest in beri-beri dates from an epidemic in Bahia, Brazil, in 1863. This was by no means its first appearance in South America, as a description may be found in an old Portuguese book published in 1756, in which the disease is described as seen in Maranhão. For one hundred years nothing more was heard of it on this continent until 1860, at which date it was again recognized at Bahia. Since that time it has been more or less constantly present in Brazil and is found in reports of cases from Para, Maranhão, Pernambuco, Bahia, and Rio de Janeiro. From time to time it has been brought from Brazil to the United States in ships, but has never obtained a foothold. In 1860 a Brazilian man-of-war entered San Francisco, having made the trip from Rio de Janeiro by way of the Suez Canal. The first case appeared at Aden six months after leaving Rio de Janeiro, and from that port to San Francisco a number of cases occurred, 18 of whom were admitted to the Marine Hospital of the latter city. The ship was reported in an unsanitary condition. Other cases have been reported from Brazil by Shattuck, Pomroy, Sequin, and others.

THE ETIOLOGY OF BERI-BERI.

Perhaps no disease has had a wider and more plausible series of etiological factors created for it. These causes may be grouped under four heads: (1) Hygienic; (2) Bacteriological; (3) Dietetic; (4) Protozoal.

Hygienic.—Again and again the subject of overcrowding has been discussed. The disease has shown a special tendency to break out in oriental goals, schools, mining camps, plantations, armies, and ships. Everywhere it is a well-known fact that in the early stages of the disease if the patient is removed from the zone of infection the disease almost immediately shows abatement. And yet the new zone may often appear to be less salubrious than the zone of infection. Thus Lane, writing of the disease in Brazil, says: "Bahia, beautifully situated upon a high ridge, easily drained, and continually exposed to the sea breeze, seems to be the headquarters of the disease. If patients are removed early, before irreparable damage has been done, to the island of Itaparica, a low flat place just across the bay, they recover almost as if by magic." In the epidemic about to be discussed it will be noted that all the cases except those brought to the hospital *in extremis* began to recover promptly after arrival. Manson's theory of gas formation refers to the possible formation of a toxin by a bacterium or fungus in the soil or surroundings, which, rising up day by day and night after night, is inhaled or otherwise introduced into the system by its absorption by food and exerts its pernicious action upon the system by its continuous poisonous effect. In support of this, Manson invites attention to the fact that the almost universal experience seems to be that as soon as a beri-beric is removed from the zone where he acquired his infection to a noninfected zone he immediately begins to improve. Thus it also clings to ships, and when these ships reach the warm climates, climates suitable for the growth of the germ or fungus, the toxin is again generated in quantity and the disease breaks out afresh.

Of the *bacteriological* theories of beri-beri there are many. None have stood the test of time. A coccus or a bacillus isolated from the intestinal tract ought to rigidly comply with Koch's laws, for what greater hotbed of bacteria to form the basis of a germ theory could one find than the intestinal tract. Lacerda in Rio in 1885 found a germ and demonstrated according to Lane "its effects upon various animals and its causal relation to beri-beri in a most convincing manner." He also found the identical germ in certain kinds of rice, and then cultivated it in a media acidulated with phosphoric acid and explained that the germ grew best in a media treated thus, and for the same reason the germ had a special predilection for the nervous system, as this tissue abounds in phosphorus.

The later views of the bacterial cause are classified by Manson under three heads:

First. A germ having a special habitat, as the throat (Durham) or the gastro-intestinal mucosa (Hamilton Wright).

Second. A germ living in the blood.

Third. A germ living in the gastro-intestinal canal.

According to Hamilton Wright, late of the Institute for Medical Research, Federated Malay States, beri-beri is a disease which may to some extent be likened to diphtheria. The primary and special area of infection is the pyloro-duodenal mucosa; that, while multiplying here, powerful toxins are elaborated which act upon the nervous system after absorption, producing the nerve degenerations. The bacillus, a square-ended bacillus which he has found in some of his cases, he believes to be derived from the feces of beri-berics, to reside in infected surroundings, and to be taken in with the soiled food in any number of possible ways according to the careless habits of the people. Hunter and Koch, working in Hongkong, have failed to confirm Wright's work.

The theory of a germ living in the blood stream, as claimed by Pekelharing and Winkler, Gerrard, and others, has so far been sterile of any confirmatory data. Of a large number of carefully prepared blood cultures from various beri-berics, suffering from different forms of the disease, Hunter and Koch obtained negative results, although the media used was bouillon, agar-agar, and blood serum.

The third theory is that of a germ living free in the intestinal tract. The number of bacteria found in the feces is legion, about 72 of which have been carefully studied. Bacteria have not been shown to cause any extensive local lesion in beri-beri, and it is therefore probable that such a germ would produce its poisonous effects by the generation of a toxin free in the intestinal canal, which would exert its pernicious action upon the peripheral and vaso-motor nerves after absorption. Such a problem, the determination of this toxin, would be the task of a physiological chemist, and it is doubtful if beri-beri has received serious consideration from this standpoint.

Dietetic.—For many years a defective diet has been duly considered as a cause for beri-beri. Of a long list of supposed causes which have been attributed to the diet may be mentioned a fish diet, infected, raw, or decayed; ingestion of arsenic with food; fat starvation; nitrogen starvation, etc. Notable is the experience of the Japanese navy, which, upon changing the ration noted a diminution and finally a disappearance of the disease. But so many other reforms took place in their navy at this same time that the diet alone should hardly receive all the credit.

Rice, whether cured or uncured, has been the subject of much study by Fletcher at the Kuala Lumpur Lunatic Asylum, and in a recent article on the disease he lays especial stress on the fact that the disease is most apt to occur among the natives using the uncured rice. Traver's experiment, in which he caused the same stock of rice as served in an infected gaol to be cooked in the same vessels and served in a healthy gaol, caused no cases in the healthy gaol; and, further, the prisoners from the affected gaol speedily recovered upon being transferred to the healthy gaol, even though they ate of the same stock of rice as before transfer. In Japan, during the late war, in spite of the experiences of the navy with the ration, there was more than nine times as many cases of beri-beri as of typhoid fever, and typhoid fever lost none of its reputation during this war.

The *protozoan* theory has lately been advanced. Hewlett and Tanner found in the Rhesus monkey a disease similar to beri-beri, and at post mortem found a high degree of congestion and cloudy swelling of the kidneys. In the urine of beri-berics they found protozoan-like bodies, which they fed to monkeys without any positive results. Again, we have the suggestion of its protozoan origin from Daniels, who advances the suggestion that a louse or some other blood-sucking insect may act as the intermediary host. There has been no reliable evidence produced to confirm the theory of a protozoan as the cause of beri-beri.

W. Hunter and W. V. M. Koch, of Hongkong, report a series of experiments with monkeys, in which they endeavored to produce the disease experimentally by—

(A) Natural infection.
(B) Feeding experiments.
  (1) With beri-beri blood.
  (2) With spleen substance.
  (3) With gastro-duodenal mucosa.
  (4) With brain substance.
(C) Subcutaneous inoculation.
  (1) With beri-beri blood.
  (2) With spleen blood.
  (3) With cerebro-spinal fluid.
(D) Intra peritoneal inoculation with beri-beri blood.

As a result of these experiments they draw the following conclusions:

(1) The incarceration of monkeys in rooms presumably infected with beri-beri virus would appear to fail to induce the disease in these animals.
(2) Feeding monkeys with considerable quantities of blood, etc., obtained from acute cases of beri-beri failed to induce the disease.
(3) Feeding monkeys with fresh gastro-duodenal mucosa obtained from fresh and acute beri-beri cadavers gave uniform negative results.
(4) Injection of considerable quantities of blood and other tissues of beri-beri into monkeys failed to produce the disease.

(5) These experiments show that the micro-organism as described by different observers in the blood of beri-beri would not appear to exist.

(6) From these and other experiments it would appear impossible to convey beri-beri from man to animals.

(7) Our investigations seem to show that in beri-beri we are not dealing with an infectious disease in the strictest sense of the meaning of the term.

THE BARROSO'S EPIDEMIC.

The *Barrosa* is a cruiser of the same type as the U. S. S. *Albany* and U. S. S. *New Orleans*, they being sister ships, the two latter having been brought from Brazil at the breaking out of the Spanish-American war. These ships are notorious for the poor sanitary arrangements for the crew. For several years the medical officers of our service have reported the wretched sanitary arrangement and allowance of air space in these ships, which amounts, according to an excellent report by the late Surg. H. N. T. Harris, U. S. Navy, to about 134 cubic feet of air space per individual for a crew of 328 men. As the *Barroso* had about the same number in her crew, according to my information, the air space per individual was about the same. So far as I was able to learn from the patients, the diet appeared to be a liberal nitrogenous diet, they being served while in port with fresh meat each day. Rice was a component part of the diet, it appearing from the statement of the patients that it was served every other day. Some of the patients, however, stated that they never ate rice oftener than once a week. Cases of beri-beri, according to the statement of some of the patients, had occurred before on board this ship. The first of the cases came to the hospital on June 9, but the most came in during July. At the time it made its appearance the weather was hot and tropical conditions were simulated. All the cases, 20 in number, came from the cruiser *Barroso*. Two cases were of an acute fulminating type and died within eighteen hours after admission. Most of the cases gave the history of having been sick for four or five days. In one case there was a history of several exacerbations of the disease during a period of some three years.

The earliest symptom was usually pain and œdema of the lower extremities, with loss of power. In none of the cases was there total paralysis, but a loss of force and power from the knee down, the patient being able to walk without the aid of a staff, but with ataxic gait. The pain was usually complained of along the inner surface of the tibia and deep in the calf, following in most cases the course of the posterior tibial nerve. Following the œdema, perhaps after two or three days there would appear more or less tingling and formication along the course of the nerve. In 11 cases the reflexes were totally abolished. The œdema was usually in the feet and ankles and in the lower part of the leg, and disappeared after four or five

days in the hospital. In 4 of the 20 cases under observation there were no symptoms referred to the upper extremity, but in the remaining 16 there was some involvement. Two complained of feeling of heat in the palms of the hands, with the sensation of cold at the tips of the fingers; some of tingling and formication of the tips of the fingers; some of formication and loss of power of the whole of the fingers; some from the wrist down, and some from the elbow down. In only one of the cases were there any symptoms referred above the knee and in none were there any symptoms referred above the elbow.

Gastro-intestinal symptoms.—Ten of the 20 cases gave a history of some gastro-intestinal disturbance in the early part of the attack. In most it amounted to gastric distress and anorexia. In only two was there vomiting, and one of these was of the acute fulminating type, which died within a few hours after entrance.

Examination of the feces showed ova of hookworm in 6 cases, the *tricocephalus dispar* in 3 cases, and the *ascaris lumbricoides* in 1 case. Hookworm was found also at autopsy in one of the acute fulminating cases.

Cardiac symptoms.—Nine of the 20 cases complained of palpitation of the heart in the early stages of the disease. The palpitation was most marked upon any exertion on the patient's part. In 7 cases equal spacing of the heart sounds were noted. This symptom was present in the early stage of the worst cases only.

Course of the disease.—In the majority of the cases the improvement was prompt after leaving the zone of infection. All of the cases came under observation early in the course of the disease, before much damage had been done, and the symptoms abated and the course of the disease was aborted (to use the words of Lane previously quoted) "like magic." In most of the cases the symptoms were on the wane in five days and the patients were able to leave the hospital and loiter about the 80 acres of park grounds in which the Naval Hospital is located. The patients had the top ward in the north wing of the hospital, where there was plenty of light and air. No drug was given for the treatment of beri-beri *per se*. Fresh air, liberal diet, and removal from the zone of infection appeared to create the conditions needed to insure a steady improvement. The cases remained in the hospital for treatment from thirteen to sixty days.

MEMORANDA OF CASES.

Case 1.—F. P. de M. This patient stated that he had been feeling ill for seven days before entrance. At that time he had œdema and loss of power in both legs from the knees down. For fourteen days he could walk only with difficulty. Much formication in the legs appeared after the œdema. Most of these symptoms except the formication in the feet cleared up in about one month. In the arms he had formication and loss of power from

the elbows down. For a month on board ship he states that he had some distress in the epigastrium, with loss of appetite. No vomiting. According to his statement, he was sick from the "epigastrium to the feet." He also states that he had more or less hardness and swelling across the epigastrium at first. Before the attack his bowels moved only every two or three days. Now he has a movement every day. While he had gastro-intestinal symptoms his bowels were constipated. Examination of the feces for ova, negative. During the early stages of his disease he had dyspnœa with palpitation, which symptoms occurred not only when attempting to walk, but also when in bed. Heart sounds show very slight equal spacing. Knee reflexes very slight after two months in the hospital. Improvement progressed without event.

Case 2.—A. X. de S. This patient states that he had been feeling sick four days before entrance. No œdema of extremeties. Pain and formication from the hips down. Walks with difficulty. Arms negative. Heart showed equal spacing of sounds. Gastro-intestinal symptoms developed about two weeks after entrance and were characterized by nausea and pain in epigastrium, which was more marked on getting up. He had epigastric tenderness on right side of median line lasting two weeks, with some fever since gastric symptoms appeared. These symptoms lasted about three weeks. Liver dullness increased. Some swelling in epigastrium. Knee jerks absent. Examination of the feces for ova was negative. Improvement was steady after entering hospital.

Case 3.—J. A. de N. This patient had been ill for six days before entrance. At first he had œdema of both legs from knee down, which lasted twenty days. A few days after the appearance of the œdema came formication, with pain in the muscles of the leg when walking. The power of the two legs after two months was still much diminished. Has a jerky walk. Upper extremities were likewise involved, there being formication halfway to the elbows, with loss of power in both arms. Gastro-intestinal symptoms existed for one month before he left the ship, characterized by loss of appetite, nausea, vomiting, and gastric distress. Bowels moved once a day on board ship, but in hospital usually three times a day. Examination of the feces showed ova of the *necator americanus*. Respiration and heart negative. Liver negative. Knee jerks absent. Steadily improved after entrance.

Case 4.—M. J. de T. This patient had been feeling ill for ten days before entering the hospital. He had first œdema and later formication of both legs from the knee down. Some loss of power in the legs and walked with difficulty. Pain in calf muscles was slight. Heart negative. In the upper extremity there was on entrance some formication from the wrist down. For three months he has had pain in the right side of the epigastrium. The liver area was normal. Bowels regular, lungs negative. Knee jerk absent. Examination of the feces for ova of intestinal parasites negative. Improved steadily from date of entrance.

Case 5.—J. L. de S. This patient had been sick for six days before entrance. There was œdema of both legs with some formication. Arms negative. Gastro-intestinal tract negative. Bowels regular. Has moderate hookworm infection and some anæmia. Has some palpitation of the heart. Knee jerk absent. The case was mild and showed immediate and steady improvement after entrance.

Case 6.—A. de B. W. Upon entrance had been ill for six days. There was œdema of both lower limbs lasting for three days. No formication, but some pain in the muscles. No symptoms referred to upper extremity. Light temperature since entrance and syphilitic eruption. Gastro-intestinal tract normal. Knee jerks fair.

Case 7.—J. A. This patient states that he has had this sickness at periods for the past three years. When taken sick about two months ago he had œdema of both lower limbs with formication and pains in the calf muscles. He also had formication of the tips of the fingers lasting for three days. During other attacks the involvement has extended to the elbows. No gastro-enteric symptoms present. Bowels regular. Heart and respiration normal. Knee jerks absent. Examination of the feces for intestinal parasites negative. He steadily improved after entrance.

Case 8.—M. A. F. This patient had been sick about ten days before entrance. The sickness began with œdema of both lower limbs. After two or three days formication of the lower limbs appeared. Has had pain in calf of legs and some loss of power. Formication was present in the upper extremity from wrists down with loss of power. On board ship he had some gastric distress. Bowels, heart, and lungs normal. Knee jerk absent. Examination of the feces showed the presence of the *necator americanus* and the *trichocephalus dispar.* Progressive improvement after entrance.

Case 9.—A. D. This patient had been feeling sick for six days before he was transferred to the hospital. Upon entrance there was pain which was most marked along inner side of the leg over the course of the posterior tibial nerve. Formication in the legs followed the œdema after two or three days. No involvement of the upper extremities. Had palpitation aboard ship, which promptly disappeared after entrance. Gastro-intestinal symptoms absent. Bowels regular. Knee jerks present. Examination of the feces showed ova of the *necator americanus* and the *trichocephalus dispar.*

Case 10.—M. A. de M. Upon entrance this patient had been feeling ill for five days. Has a well-nourished appearance. There was œdema from the knee down, with loss of power in the feet. No formication in either hands or feet. Shortness of breath and palpitation of the heart were present upon much exertion in walking. No gastroenteric symptoms. His bowels have always moved every two days. Knee reflex good in left leg, slight in right. After entering the hospital he improved steadily. Examination of the feces showed the presence of the *ascaris lumbricoides.*

Case 11.—L. E. Patient stated upon entrance that he had been sick for six days. Œdema was well marked from the knee down in both lower limbs. Pain in calf of legs. Formication along inner side of both legs from the knees down and in both arms from the elbows down. Upon walking he complained of palpitation. Heart normal. For the first ten days of his illness he had some gastro-intestinal disturbances (nausea, vomiting, and anorexia). Before the attack bowels did not move sometimes for three days; at present they move every day. Examination of the feces showed the ova of *necator americanus.* Has a well-nourished appearance. Knee jerk good above and below knee. After entering the hospital there was progressive improvement in his condition.

Case 12.—J. B. dos S. For four days previous to the entrance to the hospital this patient had been feeling ill. Upon entrance there was œdema in both legs. Pain and formication were present in both legs below the knees. Legs tire easily. Formication in both hands and wrists. Some palpitation was present in the early stage of the disease when walking, but soon disappeared. Gastro-enteric symptoms absent. Bowels normal. Examination of the feces showed the ova of the *necator americanus.* Slight equal spacing of the heart sounds was present in the early stage of the disease. Reflexes normal. After entering the hospital his condition improved without event.

Case 13.—M. S. Upon entrance patient had been sick for six days. His legs were oedematous, with pain and fomication below the knee. Formication and

tingling were also present in the terminal phalanges of both hands. No gastro-enteric symptoms. Bowels moved every two days. Equal spacing of the heart beat was present upon entrance. No palpitation or dyspnœa. Knee jerk absent. His improvement progressed steadily after entering the hospital.

Case 14.—A. F. G. This patient entered the hospital in a very exhausted condition about 4 p. m. He stated that he had been sick for six days. He had œdema of both legs from the knees down with pain and formication. In both hands he also had formication. On entrance temperature 99.4, pulse 118, which rose to 125 at 8 p. m. During the night he vomited a dark watery vomit, probably containing blood. He did not sleep during the night. When seen again at 6 a. m. he was sitting up in bed gasping for breath and complaining bitterly of pain in his stomach. He begged, in his native tongue, for a pill to make him vomit and for a purgative, saying his bowels had not moved in three days, and would lie down and sit up in bed with alternate pains and cramps in the stomach and attacks of cardiac dyspnœa. During this time the mind was perfectly clear. The body showed mottled areas of cyanosis and was bathed in profuse perspiration. He died at 10 a. m., eighteen hours after admission. His mind was clear to the end.

Case 15.—C. G. Upon entrance had been sick for six days. Œdema was present in both legs from the knees down, with weakness and partial paralysis. Pain in the calf muscles. In the arms he had tingling and formication involving the whole of the fingers of both hands. There was also formication of both legs from the knees down. Gastrointestinal history negative. Appetite good. Examination of the feces showed the ova of the *necator americanus*. Some equal spacing of the heart sounds. Well nourished. Bowels regular. Knee jerk absent. He improved steadily after entrance.

Case 16.—F. J. P. Before entrance to the hospital had been sick for ten days. There was œdema from the knees down, which cleared up after ten days in the hospital. The upper extremity was negative except for heat and sweating in the palms of the hands, with sensation of cold at the finger tips. The heart showed equal spacing of beat, pulse 112. He stated that he suffered with palpitation at night. Lungs negative except for cough of some months standing, which is no better. His appetite poor. Bowels good; has one or two movements per day. Knee reflexes good. Temperature 98.6. After entrance there was steady improvement.

Case 17.—M. M. de S. Upon entrance patient had been sick for thirty days. Œdema was present in both legs from the knee down. The œdema had been present for three weeks with pain in the calf muscles. No formication. He had frequent sweats. Thinks that swelling is worse when he sweats. The upper extremities were negative, excepting that he complained that the palms of the hands were hot while the tips of the fingers were cold. He stated that the food aboard ship was not good, so he did not care for it. Had no appetite. Sometimes had nausea. Bowels regular; one or two movements a day. Very little palpitation, but good characteristic equal spacing of heart sounds on entrance. Respiration negative. No dyspnœa. Knee jerks present. After entrance there was steady improvement. Œdema disappeared within three days. At the end of a week he was feeling well and strong.

Case 18.—Acute fulminating form brought into hospital *in extremis*, living only two and one-half hours after entrance. He was conscious, complaining bitterly of pain in the abdomen, lower extremities, and precordium. There was œdema of lower extremities. No autopsy made.

PATHOLOGICAL AND BACTERIOLOGICAL FINDINGS IN CASE 14.

By Passed Asst. Surg. O. J. MINK, U. S. Navy.

The changes found at autopsy, except those of the gastro-intestinal tract, were not of importance. The pleural and pericardial cavities each contained about 100 c. c. of fluid. The right side of the heart was engorged with blood, the engorgement also involving the veins of the thoracic and abdominal viscera. The liver was enlarged and congested. The spleen was engorged with blood and friable. The visceral pleura showed several small, yellowish, raised patches about the size of a dollar. The lungs and kidneys showed only congestion.

The veins of the stomach and duodenum showed marked congestion. The stomach was distended and contained gas, liquid, yellow curds, and some free blood. The mucosa had an injected appearance and was covered with a bloody mucus. Most of the blood was in the mucosa and could not be washed off. In the duodenum the quantity of free blood was greater and the injection of the mucosa more marked than in the stomach. In the jejunum no free blood was found and the congestion of the mucosa was less marked. In the upper ileum only smaller patches were found, while the lower ileum and the cæcum showed well-marked injected areas. Throughout the large intestine only occasional congested spots were found. The cæcum and large intestine contained a few hook and whip worms.

Cultures were taken from the spleen, the pericardial fluid, the liver, and the duodenum. No growth was obtained except from the pericardial fluid and the duodenum. From the pericardium was isolated a bacillus which corresponded in cultural and staining characteristics with the Bacillus pyocyaneus. As the same bacillus was isolated from the duodenum, its occurrence in the pericardium was considered to be the result of faulty technique in inoculating the material.

Tissue for microscopic examination was taken from the liver, lung, kidney, suprarenal, heart, spleen, œsophagus, the cardiac and pyloric ends of the stomach, the duodenum, various parts of the small intestine, the appendix, and the cæcum. The specimens were fixed in a potassium bichromate and acetic acid mixture and in osmic acid. They were hardened in alcohol and stained with haematoxylon and eosin, Gram's stain, polychrome methylene blue, and silver nitrate.

The liver showed a very slight increase of interlobular connective tissue and a marked fatty change toward the center of the lobule, Fat was almost entirely absent from the periphery of the lobule. The lungs were normal with the exception of a marked congestion and an occasional red cell in the alveoli. The yellow patches on the pleura proved to be local connective tissue growths covered by normal endothelium. The heart showed fatty degeneration, the fat appear-

ing as fine droplets in the muscle cells. There was no evidence of any change in the pericardium. The kidney showed marked congestion. The epithelium of the tubules was swollen and in places somewhat broken. The suprarenal capsules were well preserved. The spleen showed only acute congestion.

The principal lesion in the gastro-intestinal tract, as indicated by the gross appearance, was congestion. This condition was most marked in the duodenum and decreased toward the œsophagus and the cæcum. The blood was contained in the distended capillaries and veins, except in the duodenum where the villi were found packed with free blood. The lymph follicles of the duodenum and the upper part of the jejunum showed a slight necrosis with feeble staining and disintegration of the nuclei. Numerous large phagocytic cells containing fragments of red blood cells were found in the lymph follicles.

Bacteria were found in the intestinal wall only in the upper part of the jejunum. The organism, a bacillus about the size of the colon germ, stained in alternate blue and white bands and was found in the lumen of the crypts and above the muscularis mucosæ. A few were found in the submucosa. While sections of all the organs were stained with bacterial and protozoal stains, special attention was given to the kidney in view of the protozoal theory recently advanced by Hewlett and Tanner. Polychrome stains showed blue particles at the base of the cells in the convoluted tubules of the kidney. From their irregular size, staining reaction, and broken appearance they are believed to be the remains of broken-up red cells. All the preparations from other organs were negative.

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GUHA.

By Surg. F. E. McCullough, U. S. Navy.

In the July number of the United States Naval Medical Bulletin, under "Clinical Notes," we printed an account of "Epidemic Bronchial Asthma of Guam," submitted by Passed Asst. Surg. G. F. Freeman, U. S. Navy. The headnotes introducing the article mentioned the recent occurrence of another epidemic of the same disease, and the following article is the fruit of its clinical study during that epidemic. It is to be observed, however, that the disease is here described under the name "Guha," the local designation. In submitting his paper, Surgeon McCullough explains his adherence to this native name as preferable, apparently for historical reasons, to "epidemic bronchial asthma" or "epidemic septicæmia," both of which have been suggested, but which are considered too general and not sufficiently distinctive technically to warrant their acceptance.

The pathology of Guha is being studied by Assistant Surgeon Geiger, but he is not quite ready to announce his findings.

Definition.—A septicæmia, apparently peculiar to the Ladrone, Carolina, and Bonin islands occurring as an epidemic and characterized by hemorrhagic infraction of the lungs, intestinal ulceration, cloudy swelling of the parenchymetous organs, and enlargement of the mesenteric and mediastinal lymph nodes.

The initial symptoms occur either in the lungs or intestinal tract. Clinically the disease is marked by a spasmodic attack of dyspnœa or a severe diarrhea with bronze-green stools, constituting two sharply defined types of the disease; rarely the pneumonic and enteric types occur simultaneously. When the infection occurs primarily in the lungs, and the patient does not succumb within twenty-four hours, the intestinal symptoms then appear; if the infection is primarily intestinal, the pulmonic symptoms appear rather more tardily and are never accompanied by spasmodic dyspnœa. When the disease is primarily pneumonic the enteric symptoms never become the more prominent, and when the disease is primarily enteric the pulmonic symptoms never become the more prominent. The first at-

tack of the pneumonic type instead of conferring immunity predisposes to frequent recurrence. The recognition of the enteric type is too recent to have afforded opportunities for observation as to this point.

Historical and ethnological note.—The aborigines of the Ladrone Islands, termed Chamorros, at the time of the Spanish occupation were of Malaysian stock, with Melanesian and Papuan modification. Their physical characteristics, mode of living, handicraft, and language give abundant evidence of this. Though discovered by Magellan in 1521, the first settlement on Guam Island did not occur until 1668. Frequent wars between the natives and the Spanish, the latter's system of reduction, together with the marriage of the women with the Spanish soldiery (which included Filipinos and Mexicans as well as Spanish) has probably had the effect of extinguishing the original race. Though this crossing of races for over two hundred years has had a visible effect upon the physiognomical and cranial characteristics of the islanders, the large majority are, from an ethnologic standpoint, distinctly Malaysian.

Capt. William Dampier, R. N., who visited Guam in 1686, less than twenty years after the original occupation, described the aborigines as "strong bodied, large lim'd and well shap'd." To-day this may not be truthfully said of many of the islanders. Dampier found, except for a "distemper," his description of which corresponds closely to psoriasis punctata [a] (and which "distemper" was introduced by Filipinos), a people "otherwise very healthy, especially in the dry season, the air is more thick and unwholesome, which occasions Fevers." In that no other fever prevails regularly on these islands, that guha has traditionally always existed on the island, and that the name of the disease is Chamorran, the inference is logical that, unlike leprosy, it is not an imported disease, but one peculiar to the islands. The various diseases which have been imported since the Spanish occupation retain their Spanish names.

The enteric type of the disease, when occurring in the newborn, has frequently been confused with tetanus neonatorum, owing to the occurrence of tetanic convulsions. The lesions of intestinal helmin-

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[a] To indicate the trustworthiness of this observer, this description is quoted: "This Distemper runs with a dry Scurf all over their Bodies, and causeth great itching in those that have it, making them frequently scratch and rub themselves, which raiseth the outer skin in small whitish flakes, like the scales of little Fish, when they are raised on the end with a knife. This makes their skin extraordinarily rough and, in some, you shall see broad white spots in several parts of their Body. I judge such have had it, but are cured; for their skin's were smooth, and I did not perceive them to scrub themselves, yet, I have learned from their own mouths that these were from this Distemper."—A New Voyage Around the World 1717.

thiasis, almost universal in Guam, have also been responsible for diagnostic errors.

Symptoms.—Each of the types must be considered separately. In *the pneumonic type* the invasion is sudden, without any manifest prodromes. The subject is seized with a violent attack of dyspnœa, differing from bronchial asthma in that it is not merely a spasm of the bronchial muscles, but also of the muscles of inspiration and expiration. A temporary relaxation of the respiratory muscles may occur; when it does, the breathing becomes panting and is accompanied by sonorous râles. The pulse is rapid, irregular, and compressible, the face cyanosed, and the eyes fixed and staring. The spasm may recur, the thorax becoming so inflexibly rigid that artificial respiration can not be performed and the child expires, overwhelmed by the toxæmia. The picture presented by a child dead of this disease, with its tightly clutched hands, wide-open eyes, and sardonic facies, is characteristic and one not soon forgotten. But death during the invasion is not the usual result, except in the newborn, and the majority of cases are convalescent before the fifth day. The respiratory muscles gradually relax and a small amount of viscid, tough, brownish mucus is expectorated. The subsequence course of the disease sharply defines it from bronchial asthma in the following respects:

1. The number of respirations is considerably increased.
2. There is a continued fever.
3. The amount of expansion is not so disproportionate to the respiratory movements.
4. Inspiration is not so short and quick and expiration not so prolonged.
5. The percussion note has not the same hyperresonant quality.
6. Paroxysms subside gradually; never suddenly.

When convalescence is not rapidly established, the temperature continues from 102° to 105°, the skin dry, the cough hard and aggravated, and the dyspnœa constant, with rapid respiration. Fine subcrepitant râles, usually in small localized patches, but occasionally over a considerable portion of a lobe, may be heard over the entire pulmonary area. At times, when auscultation fails to elicit anything of clinical significance, post-mortem examinations reveal numerous very small hemorrhagic infracts throughout the lung. Sonorous rhonchi may be heard some distance from the patient. The patient continues in this condition four or five days, and, if recurrence of the convulsion does not cause death, a condition of stupor follows, the respirations become less labored, the right ventricle becomes distended, and death soon follows.

Coincident with the pulmonic symptoms there is an enlarged and painful liver, an increase in the area of splenic dullness, the abdomen

is distended and tender, and three or four bulky stools of a peculiar bronze-green color are ejected. Later the stools become watery and more frequent (from 10 to 30 daily), the peculiar color persisting. The urine is scanty, highly colored, and albuminous.

The invasion of the *enteric type*, unlike the pneumonic, is gradual. There are no prodromes; the bulky stools described, the supervening diarrhea, abdominal tenderness, and hepatic enlargement are all present within twenty-four hours. Vomiting is coincident with the bowel distention. On the second day the breathing becomes more rapid and auscultation reveals the subcrepitant and sonorous râles widely diffused but rarely as pronounced as in the pneumonic type. The cough is not as painful and the sputum is more easily dislodged. Spasmodic dyspnœa never occurs. The pulse is rapid (110 to 140), irregular, and compressible; it never has the wiry (tension) quality of a sthenic fever and is frequently dicrotic. The tongue is pale and coated, the skin dry, the temperature from 102° to 105°. The patient refuses food and the face possesses an apathetic appearance. About the seventh day the condition is that of stupor, the eyes become fixed, and the conjunctival reflex is lost. A convulsion may occur in which the child expires. But even when the case seems most hopeless and the patient is apparently moribund, there may be a gradual and even rapid recovery; the diarrhea ceases, the abdominal distention and tenderness subside, profuse sweating occurs, mental activity follows, and resolution of the involved lung areas takes place.

In the newborn a tetanic convulsion generally occurs within the first few days of the disease, death invariably following.

Statistics of epidemics.—An epidemic of the pneumonic type, lasting from April 14 to April 30 of the present year (1907), occurred in five municipalities, with a total of about a thousand cases, 8 per cent of the population. The infected municipalities were respectively 4, 5, 5, and 3 miles apart. The more remote and less accessible parts of the island were not infected. The first cases appeared in the capital city and spread in every possible direction. In the initial attacks of observed cases 90 per cent occurred in children under 3. Of all cases, initial and recurrent, 65 per cent occurred in children under 5. The oldest patient in whom an initial attack occurred was in a man of 24; of recurrent attacks, in a man of 76. The total mortality was about 3 per cent. As to sex, in the recorded cases at the Susana and Maria Schroder hospitals 41 per cent were males and 59 per cent females.

A second epidemic began August 5, 1907, and has not entirely subsided at the time of writing (October 1). This epidemic was not of the same proportions as that of April. It did not extend beyond the capital city and the mortality rate was about the same as the earlier

epidemic. For the fiscal year of 1907 over 10 per cent of the entire deaths on the island were caused by the pneumonic type of guha.

An epidemic of the enteric type began August 1 and has now about subsided. In the capital city over 100 cases occurred within this period of two months. Forty-two per cent of the affected were under 1 year, 50 per cent between 1 and 2 years, 4 per cent between 4 and 8 years, and 4 per cent over 70. The mortality was over 20 per cent, nearly seven times that of the pneumonic variety. Ninety per cent of the deaths were in children under 18 months and the remaining 10 per cent in the aged. The epidemic did not extend to the neighboring communities. The occurrence of about half of the cases in nursing infants, while it tends to eliminate ordinary food as the medium of infection, supports the possibility of water containing the organism. The principal source of water is suspicious wells. It is to be noted that both types of guha existed at the same time.

Epidemics of the pneumonic type have occurred during all months of the year and endemic cases are nearly always present. The only meteorological observation with reference to the occurrence of the epidemic is that of unusually chilly nights followed by heavy rains immediately preceding the outbreak. The recent epidemic of enteric guha occurred during the warm months of August and September. Endemic cases are probably present throughout the entire year.

Prognosis.—Unfavorable in the recently born. As the age increases the prognosis is more favorable, except in the enteric type, where it is unfavorable in the aged.

Sequela.—In the pneumonic type frequent recurrence is the rule, even to advanced old age. Recurring attacks do not as a rule equal the original attack in gravity. Chronic bronchitis, associated with a dilated right heart, is a frequent sequela. From the fact that no case of enteric guha was observed between the ages of 8 and 70 it may be inferred that recurrence is not the rule. Recovery without complications occurred in all the recent cases.

Morbid anatomy.—As the pathology and bacteriology of this disease will be the subject of a future article by Passed Asst. Surg. A. J. Geiger, U. S. Navy, it will suffice here to state that the post-mortem appearances in both types of guha are practically the same, except where the patient is early overwhelmed by the toxæmia and death occurs too soon for the development of secondary changes. Where the disease is primarily in the lungs the involvement was there more marked, but frequently, where it was of the enteric type, the lung involvement was equally as great as many of the pneumonic cases. A post-mortem was made in every fatal case.

Race immunity.—The percentage of foreign children living on this island is so small as not to admit of any logical deductions. No

foreign child had either variety of the disease. Two instances of the pneumonic variety in young children with Caucasian fathers and Chamorro mothers occurred, both extremely mild, convalescence being established within a few days. Passed Asst. Surg. G. F. Freeman reported a case occurring in an American boy of 4, also mild. (United States Navy Medical Bulletin, vol. 1, p. 89.)

Treatment.—The treatment is symptomatic. During the attack of dyspnœa, inhalations of chloroform and hypodermic administrations of morphine and atropine are indicated and useful. The paroxysm passed, opium in full doses combined with potassic iodide (with the view of liquifying the viscid mucus) and a stimulant expectorant have been found to be the best medicinal aids. The jacket poultice frequently changed adds to the patient's comfort. The bowels should be thoroughly evacuated and intestinal antiseptics administered. In the enteric cases, creosotal and strychnine, intestinal lavage and turpentine stupes over the abdomen have proved most efficacious. If an antitoxine be successfully made it should bear the same relation to the disease as diphtheritic antitoxine does to diphtheria.

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CLINICAL NOTES

PATIENTS BURNED IN ACCIDENT ON U. S. S. GEORGIA.

By Surg. W. H. Bucher, U. S. Navy.

There were 21 officers and men injured in the accident aboard the U. S. S. *Georgia*, in Cape Cod Bay, Massachusetts, on July 15, 1907. Of this number 1 officer and 5 enlisted men died aboard ship and 2 officers and 2 enlisted men in the hospital, making a total of 10 deaths, with 11 recoveries. Of the deaths at the hospital, 3 were due to shock, two-thirds of body being burned, and 1 to toxemia, death occurring four days after the accident.

Among those who recovered there were 4 who narrowly escaped death, as one-half of their bodies were severely burned. It is believed that their recovery was due to saline enemas, which successfully combated shock and mitigated the following toxemia. One of the four developed an extensive left pleurisy, but recovered. In all cases where shock was pronounced saline enemas were given every three hours. One pint at a time was allowed to trickle into the rectum through a small catheter, and by this slow administration it was held and acted efficiently. In cases where extreme shock was to be combated adrenalin was added to the saline solution. Its effect was instantaneous, and it proved to be a valuable adjunct. Shock was most pronounced in the cases where the face was involved. With the exception of two cases, burns running through the various degrees were to be found on all the bodies; these two cases showed burns of the first degree only and quickly recovered. Irritability of the stomach with vomiting was noted in all the severe cases, and was treated with iced champagne and nutrient material in the shape of liquid peptonoids added to the saline solution above mentioned. This irritability of the stomach passed off in three or four days.

The burns themselves were treated with gauze dressings, saturated with one-sixth of 1 per cent picric acid solution, which were placed on burned areas and kept wet; this was continued for three or four days, and boric acid ointment then substituted. Two cases of carboluria accompanied by an erythematous rash developed from the picric acid dressings. The treatment in these cases was immediately changed to wet boric acid dressings, when the untoward symptoms

declined. The principal lessons gleaned from the treatment of these cases were:

First. The extreme value of saline enemas and adrenalin for combating the shock, being far more useful and valuable than the usual hypodermic medications used with the idea of obtaining stimulation.

Second. Picric acid dressings at first certainly relieve the intense pain and help to keep the wound clean, not as much pus following this procedure as in other methods. A constant guard must be maintained for such untoward symptoms as carboluria and the erythematous rash. If they appear, the dressings must be discontinued at once, as it is unwise to throw an extra burden on the excretory system, which has as much as it can do to eliminate the toxine found in all cases of burns.

Third. Skin grafts grow surprisingly well on suppurating, granulating surfaces. It is unnecessary to wait until the wound is absolutely clean for this procedure.

Fourth. Splints applied the whole length of the arm, in extension, reduce the deformity from contraction. The same may be said of the leg.

A CASE OF PSYCHICAL APHONIA.

By Asst. Surg. J. L. Belknap, U. S. Navy.

R. M., electrician, first class, U. S. Navy, while on duty in the wireless station, navy-yard, Boston, Mass., Saturday evening, October 12, 1907, received a static discharge of unknown voltage. He was standing with his left heel resting on a terminal when the toe of his left shoe happened to touch a Leyden jar, the instrument being turned on. The shock threw him against the wall and dazed him, but he did not lose consciousness. In a moment or two he tried to speak but was mute. I saw him about fifteen minutes after the accident, and his complaints were: The presence of two lumps in his throat when swallowing, one just below the hyoid bone, the other just above the sternum; that his throat felt rough and raw, and that his sense of taste was dulled.

Physical examination showed a well-developed but only fairly nourished man, with a startled expression and course tremor of hands and forearms; throat reddened, but vocal cords moving normally; small abrasion on left shoulder; patient unable to speak or whisper, but cough and respiration normal; while writing answers to questions many incorrect letters made. Otherwise examination negative.

Family history negative.

Past history of febris intermittens contracted while on duty at Guantanamo, Cuba, February, 1907. Recurrences caused his admis-

sion on the U. S. S. *Wabash* July 22 and October 2, 1907; tertian plasmodia were demonstrated. Since contracting malaria he has lost 10 pounds in weight. For the past week the wireless men have been on duty twelve hours out of twenty-four, with the "phones" in their ears most of the time. At the time of the accident he was taking a tonic, consisting of quinine, iron, arsenious acid, and strychnine.

On October 14 his throat was examined by Doctors Coolidge and Cobb in the throat department of the Massachusetts General Hospital. No abnormality was detected, except an irregular larynx.

Treatment consisted of bromides the first twenty-four hours, throat spray, a few applications of an astringent swab, tonics, extra diet, regulated exercise out of doors, and lessons in speaking. With encouragement and by at first lifting his larynx he was taught to say "yes," "no," "good morning," "good evening," and repeat the alphabet, but each sound required a special effort.

On October 19 he was given liberty and returned the next morning talking normally. He had been persistent in the belief that he should take another shock in the opposite direction to drive the electricity out of his system, so a friend gave him a static discharge from an X-ray machine of about two seconds' duration, which almost produced unconsciousness. He stated that in a minute or two thereafter he felt "something give way" in his throat and was able to speak, though in a hollow, unnatural voice, which, however, soon changed to normal.

Tonic treatment has continued to improve his general health. He has held the 5 pounds' gain made while on the sick list and has not noticed anything abnormal about his speech.

A CASE OF RUPTURED KIDNEY.

By Surg. Edgar Thompson, U. S. Navy.

L. T., Japanese, cabin cook, U. S. Navy, Guantanamo, Cuba, was trying to board a small boat from the wharf. In doing so he fell about 5 feet, striking his right side and lumbar region across the gunwale of the boat. This occurred on September 11, 1907. During the day he was a little sore, but otherwise appeared to be uninjured. The following day the patient wanted to go to duty. About noon, however, he noticed that his urine was red, and an examination revealed that a large amount of blood was present. A few hours after he began to experience severe pain in the right lumbar region and abdomen, which radiated to the right inguinal region and testicle. There was no fever; pain still increased in severity; urine was almost pure blood; there was suppression of the renal function. During the

evening of the 12th of September he was given a careful examination, in order to eliminate rupture of the bladder, which done, and all the symptoms becoming most acute, it was decided to operate on the kidney and relieve the apparent pressure and control the hemorrhage.

The patient was prepared and placed on the table at 2 a. m. September 13, and the right kidney cut down upon. On approaching the kidney a fluctuating tumor was found. This was opened and a quantity of blood and urine escaped. The peritoneum was found to be pushed outward and would soon have given way under the pressure. The renal vessels were intact, the blood escaping from the lower pole of the kidney. No rupture of the capsule could be seen or felt. The wound was packed and dressed and the man placed in bed. The urine was drawn every three hours per catheter, the amount of the bladder contents being small and almost pure blood; but it was noticed with each evacuation that the amount of blood was diminishing progressively. On the evening of September 14 there was a sudden rise of temperature to 103.8. The patient was at once placed on the table and the dressings removed. This was followed by a profuse discharge, but otherwise the wound was normal. The malarial plasmodium was not demonstrated in the blood, but it was decided to give quinine empirically. Twenty grains of quinine were given hypodermically and the temperature fell to 99 in two hours. The next morning the temperature registered 100, and 15 grains of quinine were again administered hypodermically. After this the temperature declined to normal and the patient rapidly entered upon the stage of convalescence. At the time of writing (October 1), he is up and about doing well. Four days after the operation the blood had entirely disappeared from the urine.

A CASE OF DEMENTIA PREACOX.

By Medical Instructor S. H. Dickson, U. S. Navy.

The following case, it is believed, possesses more than passing interest, although the symptoms and condition of the patient can only be given for the short period he was under my care, his transference to the Naval Hospital, Norfolk, Va., removing him from further personal observation.

J. R. M., private, U. S. M. C.; age $19\frac{3}{12}$; a native of Austin, Tex.; enlisted at Austin, Tex., August 7, 1907; family history unknown. A person of robust physique, presenting no evidence of any disease and in the full posession of his senses, he was physically reexamined at the dispensary (Norfalk yard) on August 14, 1907, and passed as qualified. In answer to the usual questions he stated most positively that he had never suffered from nervious trouble or loss of

consciousness, nor had he had any serious disease or injury of any kind. After being fitted out he was at once drilled with the other recruits at the barracks in the usual way, performing all the evolutions in a normal manner. On the 16th of August, at 1 p. m., he was called for drill, having been perfectly well at the morning period. He was found lying on his bunk in a quiet though heavy way, with eyes opened and seemingly in a perfectly conscious condition; but when told to get up he shook his head and would not answer a word to any question. He was then brought to me, walking with some difficulty between two men, his feet inclined to drag as from obstinacy. He appeared to be in full control of his mentality, but no word could be extracted from him either by persuasion or threats; he seemed utterly indifferent to what was said and done. His manner was perfectly quiet and nonresistant. He could stand alone, with some swaying; but only with difficulty could he be made to walk, and then only a few steps hesitatingly. Various means were resorted to for two hours to make him speak, but without avail, his only movements being those of deglutition and winking. His eyes were bright and pupils normal, contracting upon the approach of a strong light, but the conjunctival reflex was abolished. When he was made to inhale a few drops of chloroform he attempted to remove the towel and muttered " take it away." A suspicion of malingering was entertained at this time, and he was placed by himself for the night and closely watched. He lay on his back without moving, generally with closed eyes. He paid no attention to offers of food or water, nor could his jaws be opened. He passed no urine, and on the following morning, the 17th instant, when again seen at the dispensary his bladder was distended and 20 ounces of urine containing a trace of albumen but no sugar were withdrawn by catheter; his bowels had not moved; he was as speechless as before and did not walk as well. Heart sounds were normal; respiration ditto; pulse full and steady. There was no evidence whatever of sensation on any part of the body to pin pricks, knife points, heat, or cold. Reflexes of knee and ankle were normal. Muscles responded to electrical stimulus, but he was oblivious to any discomfort thereby. No food or water had been taken for twenty-four hours. He would respond to no questions, seeming entirely deaf. A statement was had from a fellow-recruit who had traveled with him on the train that he had masturbated; that he had become unconscious once to a slight extent, and that he had thrown his ticket out of the window. This is given for what it is worth. The idea of malingering was abandoned and the patient was on the afternoon of the 17th transferred to the Naval Hospital in its ambulance. During the transit the horse ran away for many blocks and was only with much difficulty stopped after considerable damage had been done the vehicle. The patient being immediately looked after by the hos-

pital steward, was found lying quietly and calmly on his back with open eyes in the same position in which he had been placed on the bottom of the ambulance at the yard. He had been, apparently, totally unconscious of the runaway, with its attendant excitement, danger, and damage; he suffered no injury by the accident. No better plan could have been intentionally devised for exposing deception. The subsequent history of the case appears in the records of the hospital, but I was permitted to examine the case a few days after his admission. At that time he had by signs obtained paper and pencil and had written that he was absolutely deaf and dumb and without power to open his mouth, though cognizant of what was being done for him. The general tenor of the scraps of writing he made for me were to the effect that he was very sick, and that he urgently desired that his mother be at once telephoned for to come to him, giving the name and address of the person from whose store in Austin the message should be sent. The case was believed by the medical officers at the hospital to be one of dementia preacox.

A CASE OF ABSCESS ON THE DIAPHRAGMATIC PLEURA DURING AN ATTACK OF MALARIA.

By Passed Asst. Surg. B. F. JENNESS, U. S. Navy.

W. H. P., apprentice, second class, United States Navy, was admitted to the sick list of the U. S. S. *Iowa* at Guantanamo, Cuba, on the morning of May 14, 1904. He complained of pain, dull in character, in the lower costal area, right side, axillary line. General malaise was marked and constipation present. Temperature at noon, 102° F. Physical examination showed only moderate tenderness and gurgling in right iliac fossa.

The case continued with a gradually rising temperature curve, but with decided morning remissions. Constipation was relieved, but the pain was constant and annoying. On the morning of the sixth day the temperature rose to 104.8° F. Examination of the blood showed tertian malarial parasites, and quinine sulphate, grains 30, was given during the forenoon of that day. The morning temperature on the seventh day was 100.4° F. The patient slept well during the following night and seemed more comfortable than since admission. The temperature remained below 103 from May 20 to May 22, when, at 4 p. m., it registered 103.6°; pulse 98, volume good, tension high, and respirations 48. Examination of the right lung, elicited over a considerable area anterior to axillary line, marked pleuritic friction sounds. Morning remissions of temperature now became slight and

the patient's general condition was less favorable. Diarrhea appeared, the patient passing several thin yellowish stools during twenty-four hours; the abdomen was tender and tympanitic, and pain in right side was constant and severe. The case was now regarded as typhoid, and it was believed that the malarial element was only incidental and that it had played no part in the continuance of symptoms since the administration of quinine, to which the fever had promptly though but temporarily responded. The case was given the attention of a settled typhoid.

On May 25, at 8 p. m., the pulse increased to 110 and the temperature reached 104.6. Examination of the right lung showed flatness on percussion from the posterior angle of the ribs, through the axillary region nearly to the nipple line in front, and extending from the base to the sixth rib, axillary line. Respiratory and voice sounds were absent. The liver was palpable 2 inches below the costal margin.

On May 26 the evening temperature was 105° F. Aspiration of the right pleural sac, seventh interspace, was performed and 1 ounce of clear straw-colored fluid withdrawn. Microscopic examination of the fluid showed only a few normal blood cells. Little relief was derived from this operation. Dyspnœa was marked. The temperature and pulse were steadily rising together and the abdominal symptoms becoming more marked. Examination of the stools showed shreds of mucous membrane.

On May 26 signs of consolidation appeared at the base of the right lung over the area previously giving friction sounds. The base, posteriorly and in the axillary region, still showed signs of fluid. No bulging or deformity of the chest wall was present. A marked erythema appeared over the lower costal margin (axillary line) and over the liver area below.

On May 28 the temperature was 105° F., and signs of pleuro-pneumonia developed in the left lung. Patient now became delirious, sponge baths and ice packs having but little influence on the fever. The pulse increased in rapidity, became weak, and finally developed an irregular and intermittent character. Diarrhea and other symptoms of a severe enteritis continued.

On May 29 the right lung showed signs of resolution and the left lung of progressing pneumonia. The case continued with increasing weakness and signs of heart exhaustion, and the temperature and pulse would not respond to treatment. The facies and general aspect of the case were not of pneumonia or typhoid, but of general and virulent septic infection. Enteritis of severe character was undoubtedly present, but careful examination of the abdomen and feces

revealed nothing to account for the severity of the infection. Examination of sputum showed great numbers of pneumococci. The case progressed unfavorably until death, which occurred at 9.59 p. m. June 6, 1904. The erythema which appeared in the lower axillary line May 26 increased in area for a few days and then remained until after death.

AUTOPSY HELD ON BOARD JUNE 7.

Heart normal; pericardial sac contained about an ounce of clear fluid. Right pleural cavity opened; visceral pleura injected; lung dark grayish-brown in color; apex normal; lower lobe in state of consolidation; parietal pleura adherent in patches over nearly whole extent; lung firmly adherent to diaphragm. Upon separation of pleural adhesions the sac was found to contain about 8 ounces of clear fluid. Lung was removed. An abscess containing about 6 ounces of creamy pus was found between the layers of the diaphragmatic pleura. The abscess occupied a central position on the surface. The walls were circumscribed by a thick pyogenic membrane, plainly outlined both on the lung surface and on the diaphragm. The left pleural sac contained a small amount of clear fluid. Left lung was a dark-red color and in a state of consolidation.

Liver was normal; spleen enlarged, with signs of recent congestion; pancreas normal; kidneys normal; intestines—ileum showed dark hemorrhagic areas with mucous membrane roughened and necrotic in spots. Large intestine was normal. Cover-glass preparations of pus from abscess showed both staphylococci and streptococci.

A CASE OF HERNIA, THE APPENDIX ADHERENT TO THE SAC.

By Surg. R. C. Holcomb, U. S. Navy.

H. H., an apprentice seaman, entered the hospital August 16 for operation for hernia. There was a bubonocele in the right iliac region. He stated that whenever he lifted anything or went through the usual physical drill it caused a dull pain in the right inguinal region. He was operated upon by Assistant Surgeon Higgins and the writer on August 19, 1907. The usual incision for a Bassini operation was made one finger breadth above and parallel to Poupart's ligament, and about 4 inches in length. The external oblique muscle was split for 3 inches from the external ring, and the cord and sac were isolated. The latter contained a long, hard, finger-like mass, which on opening proved to be the appendix firmly adherent by old adhesions. These adhesions extended back for 2½

inches from the tip. The sac was opened near the internal ring where the appendix was free and it was pulled down and ligated one-half inch from the cæcum. After tying the meso-appendix in two places, the appendix was amputated. The stump of the appendix was then thoroughly treated with pure carbolic acid and afterwards with alcohol and then reduced to the abdominal cavity. The neck of the sac was transfixed and ligated, the ends of this suture were each separately threaded and brought up through the internal oblique 1 inch above the internal ring and there lightly tied, thus displacing the neck of the sac upward. The operation was completed in the usual way and the patient made a good recovery, being up and about at the end of eighteen days.

CURRENT COMMENT.

It is to be remembered that in the publication of these comments the Bureau does not necessarily undertake to indorse the opinions expressed, but will lend the pages of this section to discussion of such contemporary topics as will be of interest and value to the service.

In the near future a subscription will be solicited for the purpose of placing memorials in the Naval Medical School to Kane, Longshaw, and Gibbs, three officers of the Medical Corps of the United States Navy who died in the cause of humanity and science.

Elisha Kent Kane, assistant surgeon, U. S. Navy, won an international reputation by two Arctic voyages, the second of which he commanded. In addition, he visited and explored many countries of the Old and New World, as well as isles of the ocean. His services were recognized by the legislature of New York State, the Congress of the United States, the Royal Geographical Society, and the Queen of England. He died February 16, 1857.

William Longshaw, assistant surgeon, U. S. Navy, was killed at Fort Fisher January 15, 1865. This officer died a hero. A sailor too severely wounded to help himself had fallen close to the water's edge and with the rising tide would have been drowned. Longshaw, at the peril of his life, went to his assistance and dragged him beyond the incoming tide. At this moment a marine fell behind him, and while dressing his wounds Longshaw was mortally wounded. Admiral Selfridge, in relating this gallant action, states that it was made the more heroic by the fact that on the very day of the occurrence Longshaw had been granted leave of absence, but had postponed his departure to volunteer for the assault.

The third officer whose memory it is purposed to honor is John Blair Gibbs, assistant surgeon, U. S. Navy, who was killed in action at Guantanamo, Cuba, June 12, 1898.

As a matter of hygenic import, it is to be noted that hereafter specifications for all sheets for the Medical Department of the Navy will require that they be not less than 8 feet in length. The change in this dimension is made with a view to an ample turnover at the top when bunk or bed is made up, and is the outgrowth of a recognized

need to protect the occupant against possible danger of infection from the less frequently washed bedclothing represented by the blanket and spread, which may have become contaminated by a previous patient. Sheets are renewed with each change of patient, but not so the blanket and spread, and this prospective unusual length of sheets will provide a means for protection against transmission of disease by such fomites.

Now that finger-print identification data has become such an important part of enlistment records, it seems imperative that all concerned with its accumulation should be familiar with the principles and understand not only the requirements but the pitfalls to be most carefully avoided.

To be of any value and to insure accuracy in reading and classification the prints must be clear and distinct; complete as to extent of roll, and in regular sequence and properly placed.

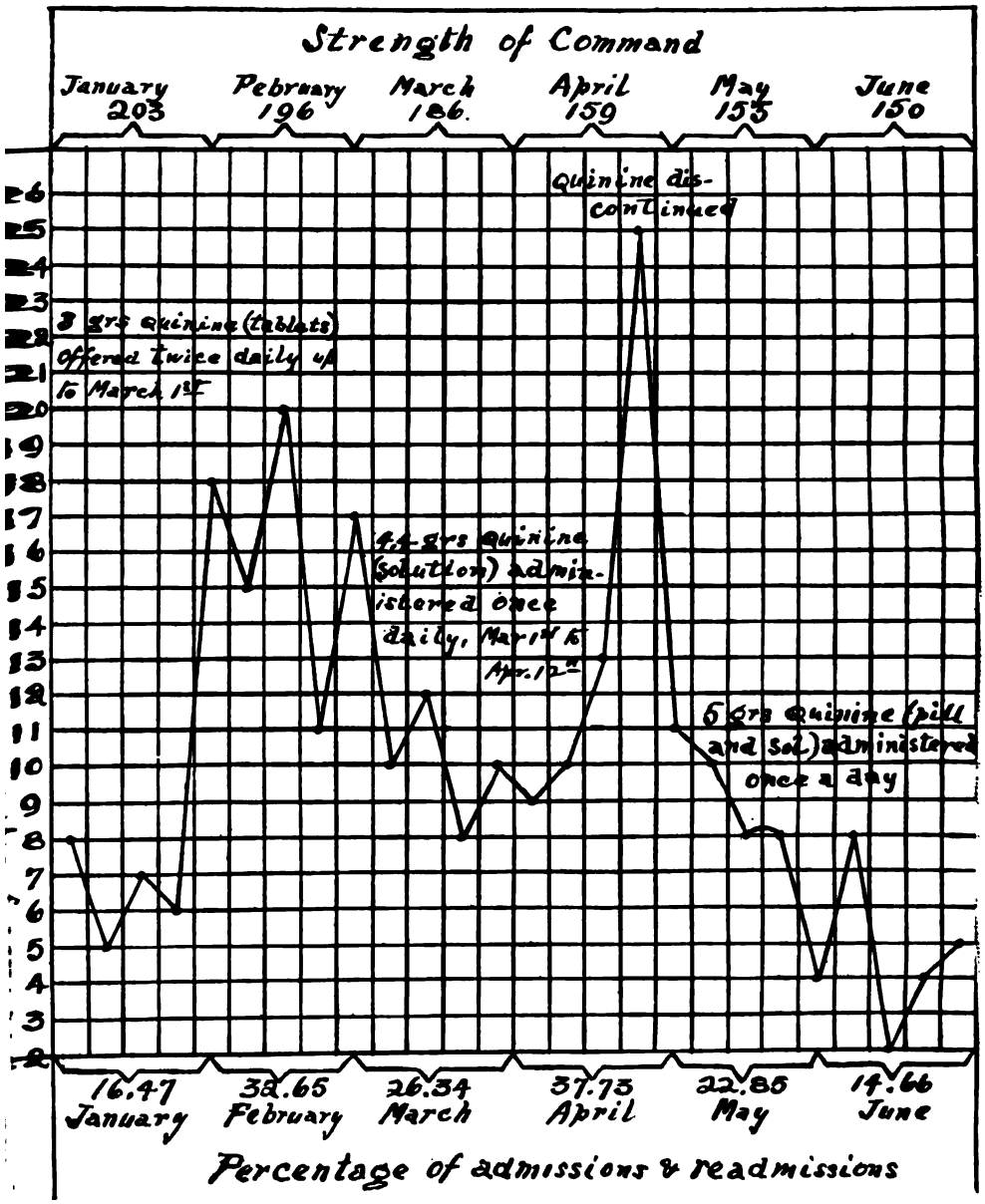
The errors commonly made in taking the finger prints may be enumerated as follows:

1. Using too much ink. Only a very small quantity of ink should be put on the plate and that should be thoroughly rolled and evenly distributed.
2. Not rolling finger far enough for delta or deltas to show.
3. Pressing finger too hard against paper, thus causing a blurred impression.
4. Inking too many fingers without using the rubber roller to distribute ink evenly on plate.
5. Not having both plate and fingers clean and free from dust before inking.
6. Not making sure that impressions of fingers are taken in their proper sequence and the right and left thumbs in the spaces reserved for them.

Further, with regard to these identification prints, it should be borne in mind that those men who are discharged with bad-conduct discharge, or as undesirable for one reason or another, or who now enlist or reenlist with discreditable purposes in view or with a desire to conceal their identity from the civil authorities, usually manage to furnish bad finger-print records.

In this connection it is important that all medical officers remember that it is not only to the interest of the service but it will save trouble for executive and medical officers if these prints are carefully taken. The medical officer is responsible for their correctness, and the duty of taking them should not be lightly delegated to a subordinate, or if the print is actually taken by a subordinate it should be done under the direct supervision of the responsible

CHART, SHOWING WEEKLY ADMISSIONS AND READMISSIONS WITH MALARIAL FEVERS AT CAMP ELLIOTT, ISTHMIAN CANAL ZONE, PANAMA, FROM JANUARY 1 TO JULY 1, 1907, WITH PARTICULAR REFERENCE TO CINCHONIZATION.



medical officer. If the first print should prove unsatisfactory it should be taken again and again, if necessary, before being forwarded to the Department, and this care will save much trouble and time and insure the completeness of legible files at first hand.

It is reported from various sources that the new first aid packet issued to the Navy and to the Marine Corps is not entirely satisfactory, particularly in the experience of the latter service. The criticisms coincide with observations reported from the Army—that the method of attaching the packet is impracticable; that the metal case soon becomes mutilated in one way or another, sometimes affecting the sterility of the contents; and that when the finish is worn off (as it soon is) the shiny metallic surface furnishes an excellent mark for an enemy. The Army has just taken steps to correct these defects, and the packet covering, though still of metal, in accordance with the recommendation of the "joint board," is now devoid of hooks, the packet being slipped into a khaki-colored canvas pouch or pocket, which is itself closely fixed to the belt by hooks. Recommendation may be made by the Medical Department of the Navy, and action taken toward similar seemingly urgent changes, but any variation in the position of wearing the packet on the uniform is not advisable. Its position should be established for the whole service in conformity with that designated for the Army by a general order.

QUININE PROPHYLAXIS IN MALARIA.

By Passed Asst. Surg. H. O. Shiffert, U. S. Navy.

As shown by the accompanying chart, the number of admissions and readmissions with malaria at Camp Elliott was high during the month of February. The command consisted of 196 men, three-fourths of whom had been on the Isthmus less than three months. This high morbidity rate was due largely, in my opinion, to the fact that the command was not receiving prophylactic treatment, because many quinine pills then offered were thrown away. From March 1 to April 12 quinine in solution, 0.225 gram per dose, was taken religiously once daily. During this period there was a steady decrease in the number of patients sick with malaria. From April 12 to May 14 the taking of quinine as a prophylactic, or even as post-malarial treatment, was made optional and but few doses of quinine were called for. Only those actually on the sick list received systematic treatment. In one month, without quinine prophylaxis, the condition became alarming and the taking of quinine by all enlisted men of the command was again made compulsory. Following this

order the admissions and readmissions to the sick list gradually decreased. The above chart speaks volumes for the value of quinine prophylaxis, and is presented as of interest in this important question.

With the increase of malarial patients during April it may also be said that there was a decided increase in the number of sick days and in the severity of symptoms in individual cases.

VACCINATION ABOARD SHIP IN THE ORIENT.

By Asst. Surg. G. M. Olson, U. S. Navy.

The rather unusual experience of conducting two vaccinations of the same community within four months was had on the *Galveston*. In February, 1907, the entire personnel, with three exceptions, was vaccinated at Manila, P. I. The vaccine was obtained from the Bureau of Government Laboratories, Manila. The three exceptions included two warrant officers, one of whom had had smallpox and numerous unsuccessful vaccinations. The other warrant officer had been vaccinated within six months and had numerous scars, so that it was deemed unnecessary to revaccinate him. This conclusion, however, was shown to be wrong by the typical success attending his vaccination at Shanghai, China, less than four months later. The third exception was a negro with the history of a successful vaccination within a year, which had resulted in a small keloid. At Shanghai, in May, he was revaccinated successfully.

At Shanghai, China, in May, 1907, following a case of smallpox in an enlisted man who, about four weeks previous, was transferred to this ship, the entire personnel, regardless of former attacks of smallpox, former vaccinations, etc., was vaccinated a second time. Vaccine was obtained from the board of health, Shanghai, China.

Table I.—*Result of vaccinations.*

(Personnel, 348.)

Vaccinated at—	Vaccinations.		
	Successful.	Partially successful.	Unsuccessful.
	Per cent.	*Per cent.*	*Per cent.*
Manila, P. I., February 4, 1907	14.5	18	67
Shanghai, China, May 15, 1907	61	18	21

Table II.—*Cases of first successful vaccination.*

(Personnel, 348.)

Vaccinated at—	Number of first takes.	Percent of personnel.	Average number of previous unsuccessful vaccinations.
Manila, P. I.	10	3	4
Shanghai, China	5	1.5	6

Table II shows that at the time of the vaccination at Manila more than 3 per cent of the crew had never been vaccinated successfully. All of these had been vaccinated unsuccessfully from 3 to 14 times, or an average of 4 unsuccessful vaccinations for each man. At the vaccination at Shanghai 1.5 per cent of the personnel had never been vaccinated successfully, the average number of previous unsuccessful vaccinations being 6. After the vaccination at Shanghai there remained only one man who had never been successfully vaccinated and was not protected by a former attack of smallpox. This man took a mild partial vaccination at Shanghai. The duration was that of an ordinary vaccination, but left only a small scar. Attempts to revaccinate him since have not been successful. The above shows that very few that are not protected by previous attacks of smallpox are immune to vaccination.

SUCCESSFUL REVACCINATION WITHIN FOUR MONTHS.

Twenty-five, or 7 per cent of the personnel of this ship, were vaccinated successfully at Manila, P. I., and took a successful vaccination at Shanghai less than four months later. This shows that in a considerable number of people the immunity to vaccination, and consequently to smallpox, disappears in a very short time. It may be possible that there are different strains of vaccine virus, as there are different strains of streptococcus, and that immunity to one kind of vaccine virus may not produce immunity to another. In this connection it is to be remembered that the vaccines employed were obtained from two widely separated places, the vaccine at Manila coming originally, probably, from America, and that at Shanghai from England. However, it is more probable that immunity in some persons disappears in a much shorter time than is ordinarily supposed. Osler states: "The duration of the immunity is extremely variable, differing in different individuals. In some instances it is permanent, but a majority of persons within ten or twelve years again become susceptible." Quoting Notter: "Very few persons are insusceptible to revaccination after a relapse of ten or twelve years, many are susceptible within five years, although the primary cicatrices may be good." As the general opinion seems to be that the immunity conferred by vaccination continues for some years at least, it is especially important to note that 7 per cent of the 348 persons constituting the personnel of the *Galveston* had a successful revaccination within four months.

VACCINATION IN THOSE WHO HAVE HAD SMALLPOX.

Eight persons on this ship had had smallpox before entering the service. Two of these were vaccinated before the attack of smallpox; six cases were not vaccinated before the attack of smallpox. Three

of these have been vaccinated successfully since the attack of smallpox. A Chinese mess attendant aboard this ship was inoculated in the nose with smallpox early in childhood. Since then he has had fourteen or more vaccinations, the last one at Shanghai being successful.

TECHNIC.

The ordinary sewing needle constituted the instrument for scarification, a freshly sterilized needle being used in each separate case.

Vaccine was obtained in bulbs and applied to the arm with a platinum loop easily sterilized in the flame of an alcohol lamp. The field of operation was prepared by scrubbing with soap and water, and then alcohol. No evidence of infection appeared in any of these cases. Two or three were excused from such duty as cleaning the side, etc., because of soreness of the axilla. Constitutional symptoms, as fever, headache, etc., were quite marked in many cases.

CONCLUSIONS.

1. The entire personnel of every ship coming to China should be vaccinated as soon as practicable after reaching the China coast. Of the personnel of the *Galveston*, 98.5 per cent had a history and the evidence of successful vaccination or a previous attack of smallpox, many with numerous scars, and yet on arriving at Shanghai 61 per cent were revaccinated with complete success and 15 per cent with partial success. Smallpox is endemic in China at all times and frequently epidemic. In Shanghai, including the International Concession, French Town, Native City, and suburbs, in the spring of 1906 there were, at a conservative estimate, over 1,000 cases a week.

2. The immunity of a great many people against vaccination disappears, at least in the Orient, within four months. Therefore, even those having a successful vaccination should, within four months, be revaccinated.

3. Even the immunity conferred by smallpox and inoculation disappears, as three of eight cases with a history of smallpox have been vaccinated successfully since the attack of smallpox.

4. The personnel of every vessel on the China coast should be vaccinated at least once a year, as in a year's time probably more than 10 per cent will again be susceptible to smallpox.

MEDICAL PROGRESS.

SURGERY.

By Surg. H. C. Curl and Passed Asst. Surg. H. W. Smith, U. S. Navy.

SURGERY OF THE THYROID.

The "Annals of Surgery" for October, 1907, contains an interesting contribution to "Surgery of the Thyroid" by Doctor Halstead, of Baltimore. He calls attention to the importance of preserving the parathyroids, and cites many cases in his extensive surgical experience where this had been demonstrated. The occurrence of distinctly different sets of symptoms when the thyroid gland and the parathyroids are removed indicated how important is the preservation of secreting substance from both. Doctor Halstead speaks of the parathyoids as "life-sustaining" organs, and in an exhaustive study of their anatomy gives a number of valuable suggestions as to the technic best calculated to leave them with a satisfactory blood supply. The fact that a form of tetany is caused by removal of the parathyroids is generally acknowledged, and the frequent fatal outcome only gives greater reason for care in operations upon the thyroids.

In operations for the removal of the thyroids Dr. Halstead prefers a short general anesthetic rather than a long operation under local anesthesia; he believes in working as near bloodlessly as possible, tying from above downward and from outside toward the middle line. He advocates the use of the ice packs (*real* chilling of the entire region) to prevent, in part, the very severe reaction after operation, and reports a drop of 30 in a rapid pulse from its application for less than two hours. He further recommends the evacuation of even small collections of blood and serum from the wound, as, in his opinion, these contain products which, when absorbed, cause the symptoms of thyroidism.

VARICOSE VEINS.

In summing up results from operations for varicose veins of the lower extremity (Boston Medical and Surgical Journal, September 12, 1907) Doctor Bottomley concludes that the so-called Mayo method is best. This method is by complete removal of the internal saphenous vein through openings made several inches apart and with the assistance of a special instrument. It is very strongly urged that

the condition of the deep veins be demonstrated before operation, as occasionally there will be œdema and an unpleasant numbness due to incomplete return of the circulation. A few cases of embolism are reported. The strictest asepsis is needed in these cases, and even with this there will now and again be some persistent serous oozing which stops only after several days.

DANGERS FROM X RAY.

As we secure more data regarding the use of the X ray we are forced to the belief that it is a far more dangerous agent than we had supposed. The indictments against it are increasing, and among them it seems certain that we must place carcinoma. Dr. C. A. Porter, of Harvard Medical School, in the "Annals of Surgery," November, 1907, reports in detail a case of multiple carcinomata following X-ray burn, and quotes several others (eleven). His case survived after ten years of treatment, numerous operations, and great mutilation of the hands; a number, in the series referred to, died. He sums up as follows:

1. For the atrophic condition of the skin and the telangiectases nothing can be done.
2. Hypertrophic changes, keratoses, and warts may with safety be treated in the usual manner. If such treatment fails, excision with or without skin grafting will probably relieve the pain and result in a cure.
3. Excision and grafting will prove to be the best treatment for recurrent fissures.
4. All ulcerations which under ordinary treatment remain open after three months should be thoroughly excised and very carefully examined. The subsequent treatment, depending upon the result of the microscopic examination, should be skin grafting, further excision and grafting, or amputation.
5. As the history of almost all of these cases of severe and chronic dermatitis dates back to early exposures, without the protection which our present knowledge demands, it is to be hoped that the number of victims of too enthusiastic work in an untried field will steadily diminish.
6. In the meantime I have no hesitation in recommending the early excision of all persistent X-ray ulcerations, in order that subsequent malignant degeneration may be prevented.

STATIC FLAT-FOOT (OCHSNER).

In one of his characteristically practical and convincing articles Doctor Ochsner, in the Jour. Am. Med. Ass'n for November 23, gives his treatment for "flat-foot." He rather deplores the term "flat-foot," as he considers that many painful and disabling conditions may be present, due to weakening of the muscle tone and the throwing of strain on the ligaments, where in reality there is very little loss of the arch. In fact, there may be more disability at this stage than when the arch has entirely given away. He urges the need for building up the muscular system as a whole, especially the

anterior and posterior tibial muscles and the other leg muscles. He likens the indiscriminate use of ready-made steel insoles to giving "blue mass" for every variety of abdominal pain and says that even in the cases where some benefit comes from the use of the insoles, additional general treatment and muscle development is not to be neglected.

His treatment consists in the application of adhesive strips to the heel, ankle, and lower leg. He applies the plaster while the patient is holding his foot extended and with the sole rotated inward by a loop of bandage. Each longitudinal strip is applied first firmly to the outer side of the leg, but with no tension; then the end is carried around the plantar surface of the heel and, with tension, applied to the inner surface of the leg; fore and aft strips are alternated with these and each one of each series overlaps the last. Broader strips cover in the top of the foot, the ankle, and front of the leg. He leaves these strips on for four to eight weeks and then renews. Immediate benefit is usually secured; functional cures are the rule and, in early cases, anatomical cures are not uncommon.

ACQUIRED DIVERTICULITIS OF THE LARGE INTESTINES.

In July, 1907, Surgery, Gynæcology, and Obstetrics, W. J. Mayo speaks of this group of cases which have only recently been placed on a sound pathological basis.

The common features are: An elderly individual, nearly always a male, and commonly a sufferer from constipation; sudden onset of symptoms of a localized peritonitis, frequently recurrent; a tumor rapidly develops, usually in left abdomen and in the middle or lower quadrant. The clinical appearance is that of a *left* appendicitis.

There are three clinical groups: First, those in which an intraperitoneal abscess forms with spontaneous or operative evacuation; second, those cases giving rise to acute or chronic obstruction necessitating operation; third, those in which the symptoms are mild and recovery occurs spontaneously. In cases that recover, tumefaction and tenderness may persist and relapses are possible.

Surgical treatment: Localized suppurative cases must be drained freely; if acute obstruction also is present, a temporary artificial anus should be made, a secondary resection probably being advisable. If a considerable tumor be present with persistent symptoms, primary resection will anticipate the formation of abscess or fistula. Milder cases do not require operative treatment.

Pathology: The diverticulæ are usually simple herniæ of the colon mucosa through congenital or pathological defects in the musculature. They often occur in epiploical appendages. The lesions present are *ulcerative*, true "diverticulitis," tending to perforation;

and *chronic inflammatory.* "Peridiverticulitis," which tends to produce great thickening. These lesions while they may be present in any part of the intestinal tract, usually are found in the large intestine between the splenic flexure and the rectum.

Diagnosis is usually impossible even at operation. The gross appearance of a chronic inflammatory diverticulitis may be indistinguishable from that of carcinoma, actinomycosis, tuberculosis, and other diseases. A careful microscopic examination is necessary to differentiate the lesion.

A NEW INCISION FOR APPENDICECTOMY.

A new method of opening the abdomen for appendicectomy is described by Dr. J. H. Richards in the Medical Record of October 19. He calls it the Wylie method. It consists of a curved, almost vertical incision crossing the right semilunar line from above inward and downward. The aponeurosis is cut and the anterior rectus sheath exposed. This is cut *transversely* for 1½ inches, the belly of the rectus retracted, and the posterior sheath cut in the line of the first (i. e., transversely) and abdomen opened as usual. Claim is made that the muscle, when it contracts, tends to approximate the edges of a transverse incision in the sheath, but to cause a longitudinal incision to open. The obvious objection to this incision is the difficulty of enlarging it, if such were necessary, and its being by no means a good incision through which to establish drainage.

PATHOLOGY AND BACTERIOLOGY.

By Passed Asst. Surgs. C. S. Butler and O. J. Mink, U. S. Navy.

THE OPSONIC INDEX IN ERYSIPELAS AND ITS RELATION TO TREATMENT BY KILLED CULTURES OF STREPTOCOCCI.

In the American Journal of the Medical Sciences for November E. H. Schorer gives the results of the investigation of thirty-six cases of erysipelas with regard to the opsonic index and the effect of vaccination upon the course of the disease.

It was not found practical to isolate the causative streptococcus in each individual case. A uniform mixture of streptococci from four different cases of erysipelas was used. Each of the four strains gave the same culture characters of streptococcus pyogenes, were hemolytic, were acid forming in milk, and nonfermenters of inulin. Six glycerine agar tubes to which 20 per cent of sheep's serum had been added were inoculated with the four strains (one tube from each of two strains and two tubes from each of two others) and 2 or 3 c. c.

of sterile salt solution used to make the bacterial emulsion from these six tubes after twenty-four hours growth in the incubator.

Isolated cocci were gotten by shaking this emulsion for one and one-half hours in a test tube with sea sand. The sand and emulsion were centrifugated for one minute and the fluid drawn off. In this way short chains (2 to 4 cocci) were uniformly obtained.

The leucocytic emulsion was gotten by drawing 10 drops of blood into 10 c. c. of a 1.5 potassium citrate in normal salt solution. The index was gotten in the usual way recommended by Wright and Douglas.

In determining the limit of error when several specimens of serum were drawn almost simultaneously from the same individual the greatest variation of Phagocytosis was represented by the figures 1.8 and 2.1. The Phagocytic indices of ten normal individuals varied between 9.48 and 4.37 as determined by two workers. "Pooled serum of several supposedly normal individuals was found to give less error than when one serum was taken as the normal."

For making the vaccine the same strains of cocci used in determining the indices were employed. It was standardized in the usual way.

From the result of a number of opsonic index determinations, made upon different patients at different days after the beginning of the disease, it appears that erysipelas causes an increase of the opsonic index up to a maximum on about the third day, after which there is a gradual fall.

Thirty-seven patients received injections of killed cultures; of these some received 25,000,000, others 50,000,000, and others 100,000,000 cocci. Some of the results of these vaccinations are the following:

In ten the index rose without preceding fall.

In eight the index fell without subsequent rise.

In four the index remained unchanged.

In four the index fell and remained depressed.

When 25,000,000 cocci were injected no negative phase occurred. Only one-half the patients discharged as cured have a higher index on discharge than on admission. The opsonic index showed no constant change at the time of desquamation.

In twenty-two cases of erysipelas the opsonic indices fell after desquamation. Of three cases of recurrent erysipelas two showed a lower index at the time of desquamation than there had been before. In cases receiving more than one injection, the first injection of killed cultures produced no marked increase in the opsonic index. The second injection, made after from three to ten days and smaller than the first, usually resulted in an increased opsonic index.

Clinical results.—No conclusions can be drawn as to the effect of vaccination upon temperature and delirium. The average duration

of erysipelas in the patients treated by vaccination is about the same as in another series of patients receiving only local treatment. Vaccination does not prevent migration even if the opsonic index is high. Vaccination can not be expected to prevent recurrence.

The determination of the opsonic index is of no value as an indication of the severity of the disease nor for prognosis. While vaccination may apparently shorten the disease, its value in this particular is difficult to determine.

PROPHYLAXIS AGAINST SYPHILIS.

In The Annals of the Pasteur Institute for October, 1907, Metchnikoff and Roux report further work upon the prevention of the development of syphilis by means of calomel ointment and also by injections of atoxyl. The best results are gotten with an ointment containing from 25 to 33 per cent of calomel and 75 to 67 per cent of lanoin. To make this ointment softer, ten parts of vaseline or neat's-foot oil may be added with advantage, but any attempts at replacing calomel by other mercurial preparations or by lessening the amount have not resulted favorably. The use of nitrate of silver as a preventive has not been successful. The prophylactic effect of calomel ointment is proven by so many experiments that it can not be doubted, only it must be used within an hour or two of the infecting contact. Calomel ointment will not effect prophylaxis if used several hours after the infecting contact.

On account of its efficacy in the infectious spirilloses of animals the authors were led to try injections of atoxyl to prevent the development of syphilis in inoculated monkeys at periods of time beyond the limit at which calomel ointment was effective.

In the first experiment two "Java Macaques" were inoculated with the virus of syphilis and one given 90 centigrams of atoxyl in six injections, the first being on the day of infection. This monkey developed a transient paralysis of the hind legs, as the dose of atoxyl was too great in proportion to the weight of the animal. The second monkey received 30 centigrams of atoxyl in four injections, the first being given eight days after infection. Neither of these monkeys developed syphilis, though three other monkeys inoculated with syphilitic virus at the same time and used as controls all developed chancres at the points of infection.

To ascertain if smaller doses were effective a monkey received 20 centigrams of atoxyl in four injections given the same day of infection. This monkey remained healthy, while three controls infected at the same time contracted syphilis.

Of four other monkeys inoculated with syphilis, one received 15 centigrams of atoxyl on the following day, another 15 centigrams on the fifth day, another 10 centigrams on the fifteenth day. The fourth

monkey received no atoxyl, and, alone of the four, developed a chancre on the thirty-fourth day.

In trying to establish the minimum preventive dose, one inoculated monkey received 25 milligrams. This monkey developed a chancre. Another monkey received 10 centigrams of atoxyl at the beginning of a primary lesion. The chancre was arrested for a short time but recurred.

Two monkeys, which had formerly been inoculated with syphilis, but in which infection had been prevented by injections of atoxyl, each received a second syphilitic inoculation. These received no atoxyl injections after the second inoculation. One of these developed a chancre seventy-seven days and the other ninety-one days after the primary inoculation. This shows that, following the first inoculation, there was neither generalization of the virus nor consecutive immunity.

Trials at giving atoxyl by the mouth were unsatisfactory. For man, 185 centigrams given in three injections of 75, 60, and 50 centigrams, respectively, is recommended. Given this way the originator of the method (Hallopeau) has seen no untoward symptoms either of intolerance or intoxication.

Two men who had had suspicious contacts received two injections of 50 centigrams each of atoxyl and had no bad effects from the drug.

It is hoped that preparations of arsenic less poisonous than atoxyl will be found. Efforts to this end are under way. The treponema pallidum develops with great difficulty after inoculation. By the best available means for search it has been impossible to find them in fluids from around the site of inoculation before the fifteenth day. It is for this reason that the prophylaxis of syphilis is relatively a simple matter.

PARISITOLOGY.

By Surg. R. C. Holcomb, U. S. Navy.

THE WOOD TICK (DERMACENTOR OCCIDENTALIS) AND ITS RELATION TO ROCKY MOUNTAIN SPOTTED FEVER.

H. T. Ricketts in the Journal of the American Medical Association of July 6, 1907, and October 12, 1907, communicates his further studies of the rôle of the wood tick in Rocky Mountain spotted fever.

In previous articles he has described the transmission of tick fever by the adult male and female wood tick (*Dermacentor occidentalis*), and he states that he has since repeated these experiments many times.

With regard to the form in which the tick survives the winter, Ricketts considers two theories: First, that it secretes itself under

stones or beneath the bark of dead trees, or burrows into rotten stumps, to remain in these hiding places until the advent of spring, and second, that the ticks may be found on horses or cattle in the hills during almost any month in the winter. The second theory has had ample verification, as several hundred ticks were picked from horses brought in from the hills during January and February. Four nymphs were obtained among those gathered in January, while those gathered in February were all adults. Of adult females gathered in March some began the deposition of eggs in a few days. Ricketts thinks that the popular idea that the ticks disappear in July to reappear with the spring is perhaps due to ignorance of the larval, nymphal, and moulting forms, as descriptions of these forms to the residents has frequently resulted in the information that they had been observed, although not identified.

THE SUSCEPTIBILITY OF OTHER ANIMALS TO INFECTION BY TICK BITE.

Ricketts and Heinemann found that the indigenous gopher, or ground squirrel, may be infected by inoculation and that the resulting attack of spotted fever confers immunity against further attacks by this same means. With the first horse that was used there followed a high but short course of fever and immunity against subsequent inoculations of the infected blood of both man and monkey. A second horse was inoculated with infected man's blood, but was negative to reaction. A calf 2 weeks old showed no reaction. The guinea pig, which in the early experiments with ticks was used alternately with monkeys, was in the later experiments used almost entirely and showed a more or less uniform susceptibility to the infection.

INFECTED TICKS IN NATURE.

A group of thirty-six male ticks was obtained at one of the ranches of the infected valley, and when allowed to feed on a guinea pig there resulted a typical attack of the disease, the organs of the animal at autopsy showing absolute freedom from any bacterial infection.

THE VIRUS MAY BE TRANSMITTED FROM AN INFECTED FEMALE TO HER YOUNG THROUGH THE EGGS.

All of the females used in these experiments were first allowed to feed on healthy guinea pigs who showed no reaction. The ticks were thus found to be uninfected and were divided into two groups. The first group were to be infected before impregnation and the second group to be infected after impregnation. Ricketts obtained his most satisfactory results from females that were infected after impregnation. As a result of his experiments with the eggs of two different ticks which had been previously infected, the disease was produced by the bite of the larvæ. In each experiment the feeding

of the larvæ produced the disease in the guinea pig, and examination of the pig's organs showed it to be free of bacterial infection. Emulsions were then made of the spleen and the liver of each animal, and this in each instance was inoculated into a healthy control. In the first experiment the inoculation reproduced the disease, and the animal died. In the second experiment the inoculation produced a severe infection, and the animal subsequently recovered and remained free of any reaction after further immunity tests.

THE TICK MAY BECOME INFECTED DURING THE LARVAL STATE AND REMAIN INFECTIVE DURING THE NYMPHAL STAGE.

The females used in these experiments were first shown to be free of infection by testing on healthy guinea pigs. After about two-thirds of the eggs laid by one of these females had been hatched, the larvæ were placed in a tick-proof cage with a guinea pig, who, at about the time the larvæ were ready to feed, was inoculated with spotted fever. When the larvæ had fed sufficiently they dropped off and crawled up on the canvas, which covered the cages, and from there were removed and placed in boxes to await molting and the nymphal stage. When a sufficient number had reached this stage they were placed in a fresh cage with a healthy guinea pig on whom they were allowed to feed. In several experiments the disease was produced in various healthy animals, who showed the usual train of symptoms.

THE VIRUS EXISTS IN THE GUT AND THE SALIVARY GLANDS OF THE INFECTED TICK.

Ricketts reports one instance where the salivary glands and alimentary sac were removed from a diseased male tick whose infectivity had been proven on a healthy guinea pig. Because of the difficulty of removing the alimentary sac without rupturing, the salivary gland was first removed. The gland and sac were each separately triturated in sterile salt solution and injected into healthy guinea pigs. Both injections caused in the respective pigs used in the experiment a course of fever with swelling of the scrotum and hemorrhagic areas, ending ultimately in each case in recovery. The animal in which the salivary gland trituration was used showed the most severe form of the disease. Both guinea pigs were subsequently given immunity tests and showed no reaction. Ricketts regards it of importance to repeat this experiment, using a different tick for each structure to be removed—that is, one for the salivary gland and one for the alimentary sac.

SUMMARY.

The following summary is given by Ricketts in his last article, in which he reviews the points which he has established in the rôle of

the Rocky Mountain wood tick in the spotted fever of western Montana:

(1) Infected ticks exist in the so-called infected districts in nature.

(2) Both the adult male and the female may acquire the disease by feeding on an infected animal, and may transmit it to a normal susceptible animal for a period of several weeks thereafter.

(3) During either of its intermediate active stages, larval or nymphal, the tick may acquire the disease in the same manner, retain it during molting, and prove infective when it reaches the subsequent active stage.

(4) The infected female may transfer the disease to her young through the egg. It is possible that this does not happen in all instances, and it is quite certain that the brood of an infected female may include many infected larvæ. This seems to have been proven in three of my experiments, in which the infectivity of the females had been proved before oviposition; the larvæ in these experiments failed to infect normal guinea pigs.

(5) The virus exists in both the salivary glands and the gut of infected ticks at a certain time, and since it also invades the generative organs of the female, the condition is probably one of a generalized infection, at least for a period. The disease is not highly destructive to the tick.

THE SPIROCHÆTE OF THE RELAPSING FEVER OF BOMBAY.

Capt. F. P. Mackie, I. M. S., assistant to the director, Bombay Bacteriological Laboratory, publishes a preliminary note on the Bombay spirillar fever in the Lancet of September 21, 1907.

MORPHOLOGY.

According to Mackie the length of the spirochæte varies from 7 to 90 microns, although the ordinary length is from 10 to 16 microns. In fresh blood the organism is always of a corkscrew shape, but in films this shape is lost and it appears in open curves. Division takes place transversely. Attempts to demonstrate an undulating membrane of flagella were unsuccessful, even though the spirochæte would in its last dying moments clear a space in the granular background accurately corresponding to its curves. Mackie is of the opinion that the terminal flagellum is an empty or collapsed sheath or ectoplasm caused by the shrinkage of the cytoplasm after division. Three movements are described: First, rapid translation from one field to another; second, vibratory or thrilling motion; third, an undulating or swaying motion seen in dying forms.

The spirochæte is found in numbers at the height of the fever in all of the organs except the spleen.

CULTIVATION.

Attempts at cultivation were unsuccessful, although the organisms were obtained in the living state from the surface of dry agar as late as the tenth day after attempting the culture.

THE BEDBUG AS THE CARRIER.

The *Cimex lectularius* was used in experiments to test their ability to carry and transmit the disease. They were first allowed to feed on infected monkeys and were then dissected. In some cases the spirochætes were found in the alimentary tract as late as the seventh day after feeding, but Captain Mackie points out that they were always found *in the upper alimentary tract and in the presence of fresh blood.* Of 53 bugs collected from the Arthur-road Hospital for Relapsing Fever, Mackie found, after careful dissection, only one insect containing spirochætes, and in this bug they were few in numbers. In a series of six experiments, infected bugs were permitted to feed on healthy monkeys. In the first monkey used the disease was produced eleven days after being exposed to the bites of 30 infected or fed bugs. None of the other five monkeys became infected by this method, although they were subsequently inoculated and contracted the disease, thus showing that they were not immune. It is interesting to note that although all the experimental monkeys were kept in the same room—albeit in different cages—none of them contracted the disease except through experimental infection or inoculation.

SUSCEPTIBLE ANIMALS.

Mackie found the following list of animals susceptible to infection by the Bombay Spirochætes in the following order of susceptibility: (1) monkeys, (2) white mice, (3) white rats, (4) white rabbits, (5) black rats (*Mus rattus*), (6) brown rats (*Mus decumanus*), and (7) guinea pigs. In monkeys, after inoculation with infected blood from a human source, the spirochætes appeared usually on the third day.

CONCLUSIONS.

In summing up the results of his work to date Captain Mackie closes his article with the following paragraphs:

(1) It was found possible to transmit the disease from an infected monkey to an uninfected by means of repeated puncture from the former to the latter with a grooved needle. A similar result was obtained with freshly-drawn infected defibrinated or citrated blood. The artificial proboscis experiment proves that spirillar fever can be conveyed without any developmental stage and suggests that if the infection is carried by insect agency the method is more likely to be by a soiled proboscis (as is probably the case in some Trypanosome infections) than through the medium of a developmental stage.

(2) It was found possible to transmit the disease to monkeys by feeding with infected blood. The dose required was rather larger than by subcutaneous injection and the incubation stage was prolonged by two or three days. Spirilla (whether specific or otherwise) have been seen several times in the urine of infected patients, but attempts to transmit the disease by injection of or feeding with this secretion have failed. These facts suggest the possibility of an alter-

native route in human epidemics, and certainly opportunities are not wanting for such transmission amongst the native population.

(3) A monkey was injected with blood from a patient who was in the apyrexial period and whose blood proved to be free from spirilla. The monkey failed to develop the disease at the usual time, but five days after the injection of the monkey, the man had the relapse and the monkey a primary attack together; spirilla appeared in the blood of each and the disease ran its usual course. This suggests that (*a*) the spirillum remains in the circulating blood in an unrecognized or ultra-microscopic form, (*b*) that the blood is infective during the apyrexial as well as the pyrexial period, and (*c*) that there is a definite cycle of development which comes to a crisis with the appearance of visible spirilla at definite intervals.

THE SPIROCHÆTE PERTENUIS (CASTELLANI) IN YAWS.

E. W. K. von dem Borne, of Java, in the Journal of Tropical Medicine and Hygeine for November 1, 1907, reports his findings in 128 cases of yaws. After having first cleansed the surface of the papule with alcohol and ether and removed all crusts, the papule is pressed at its base and the exuded serum thus obtained examined both in the fresh state and later in dried and stained films. The *Spirochæte pertenuis*, according to Borne, varies in length from 3 to 22 microns, and shows accordingly a variable number of spirals, sometimes as many as 12. He describes two delicate flagella at one of the extremities of some of the organisms. In other cases at one of the extremities he has observed a circle-like or loop-like formation. In fresh specimens the *S. pertenuis* shows at first a screw-like motion, which gradually becomes slower, and after some hours they clump together as if agglutinated.

Out of 76 intact young papules, Borne found the *S. pertenuis* 73 times. In the old ulcerated papules other organisms are found and the *S. pertenuis* could not always be demonstrated. In these old papules Borne detected it in only 2 per cent of the cases.

In the 128 cases the blood of the general circulation was negative, though several films were examined in each case. In 5 cases in which the juice of the superficial lymphatic glands were examined the *S. pertenuis* was found abundantly in each case.

TROPICAL MEDICINE.

By Surg. E. R. Stitt, U. S. Navy.

MALARIA.

Ross. The prevention of malaria in British possessions, etc. The Lancet, September 28, 1907.

Simpson. Antimalarial sanitation. British Medical Journal, October 19, 1907.

Ziemann. Malaria prevention, etc. British Medical Journal, October 19, 1907.

Several important papers on the subject of antimalarial sanitation have appeared recently, the most valuable of which are those by

Maj. Ronald Ross, Dr. W. J. R. Simpson, and Prof. Hans Ziemann, noted above.

Ross believes that in tropical sanitation against malaria, yellow fever, and probably filariasis general mosquito reduction is the fundamental procedure. He pays a glowing tribute to Colonel Gorgas as the greatest living authority on this subject and agrees with him in recommending the destroying of breeding places by surface and subsoil drainage, as of primary importance. In addition, he considers prophylaxis by quinine, by screens, and by segregation—such measures, however, to be considered only as adjuvants. In connection with the screening of public buildings he refers to the danger of wasting funds which might better be applied to drainage. In discussing so-called "quinine prophylaxis," he makes the very pertinent observation that quinine is not a prophylactic but merely an extirpating agent, and that it is not good policy to substitute a measure which does not exclude infection (merely extirpating it in some cases) for one promising certain exclusion. He, however, recommends screening and cinchonization in the case of camps and isolated houses on plantations.

Doctor Simpson considers that the prevalence of malaria in a district is better determined by examining children for evidence of infection rather than by searching for malaria-bearing mosquitoes. He refers to the danger of overlooking the larvæ of malaria-transmitting Anophelinæ associated with Culicinæ in the same breeding pool. Referring to the successful antimalarial measures at Port Swettenham, he considers a protective zone of a quarter of a mile as probably sufficient. He points out, however, the possibility of a periodic gentle wind carrying mosquitoes from outlying marshes over such a zone. He refers to the methods adopted at Port Swettenham of preventing, by a bund, tidal waters from overflowing the low-lying land, and, in addition, the drainage of this land to lower the subsoil water and give free outlet to the rain water. He brings out strongly the dangers arising in connection with various works of construction, especially the forming of artificial pools by railway embankments.

Professor Ziemann notes that up to the present time the most thorough attempts to prove the existence of malarial parasites in mosquito eggs have been in vain. In connection with quinine prophylaxis of malaria, he observes that easily soluble quinine must be used. He states that absolute protection against first infection without doing injury to the body can not be effected by quinine alone. One must with the smallest and least possible disturbing doses of quinine achieve the highest protection against malaria. He thinks that prophylactic quinine doses should correspond to scientific therapeutics, so that for a 1 to 10,000 solution in the blood a dose of 1 gram is necessary.

Again, as quinine is eliminated in four days, the taking of 1 gram of quinine every eight or nine days is not sufficient. He recommends 1 gram of quinine every four days, combining it with potassium bromide if nervous troubles indicate it. He states that it has lately been found that the larvæ of anopheles would exist in water containing 2 per cent of salt, hence that the flooding of swamps with sea water would not appear a sufficient measure for their destruction. As protection against bites of mosquitoes he does not attach much importance to the use of oils and ointments having odors supposedly objectionable to the insect.

BILHARZIASIS.

WILLIAMSON. A further note on bilharzia disease in Cyprus. British Medical Journal, November 9, 1907.

Doctor Williamson reports several cases of bilharziasis in Cyprus, in which only bladder symptoms were observed. He states that no rectal signs were observed. The ova examined had the terminal spine characteristics of Schistosomum hæmatobium.

While the coexistence of bladder and rectal involvement and the discovery of lateral and terminal spined eggs in such cases in Egypt has led to the belief that only a single species of schistosomum existed there, the above note of Doctor Williamson would appear to lend weight to the views of Sambon and Holcombe that one species produces bladder involvement with a terminal spined egg and that the species having a lateral spined egg produces rectal trouble. Holcombe, from a study of a number of cases of rectal bilharziasis in Puerto Rico, in which he only observed lateral spined eggs, believes this to be due to a species distinct from the Schistosomum hæmatobium. Sambon, for similar reasons, has considered it a separate species and has named it Schistosomum mansoni.

GENERAL MEDICINE.

By Surg. F. L. Pleadwell, U. S. Navy.

TUBERCULOSIS.

The following quotation from an editorial note in the Medical Record of October 19, 1907, forms a fitting introduction to an epitome of recent articles written, one in support of the inhalation theory of origin of tuberculosis and the other with a decided leaning toward the infection theory as being the more important:

The particular predisposition of the lung to tuberculous infection has always made it seem natural to assume that the infectious material gained access to the body through the respiratory tract. Those who share Koch's belief in the nonpathogenicity for man of the bovine bacillus of course defend this position

most warmly against the objections of Behring and his followers, who are of the opinion that the nonresisting intestinal mucosa of infancy is the most common portal of entry for the tubercle bacillus. This contention connotes a belief in the transmission of infection through milk, and consequently attributes widespread virulence for the human being to the bovine organism. Numerous observers have sought to throw light on the point at issue by experiments in which animals were caused to inhale tubercle bacilli or the organisms were introduced into the gastrointestinal tract. The results of this work have not been conclusive, however, and in fact are almost susceptible of being used as arguments in favor of either theory.

The first of the articles above mentioned, written by Theobald Smith, in the Boston Medical and Surgical Journal, September 26, 1907, on "The Channels of Infection in Tuberculosis, etc.," is of more than ordinary interest, dealing in a lucid and convincing manner with the etiology of this disease in the light of recent activity in the study of the digestive tract as a portal of entry for tubercle bacilli. The writer does not accept the latter theory in its entirety, but adheres to the inhalation theory as still being the usual method of infection. While this writer demonstrated the existence, in 1898, of two distinct types of tubercle bacilli, viz, the human and the bovine, he does not, by reason of this differentiation, side with Koch in the view that the danger of infection from bovine tuberculosis could be considered a negligible factor in the human disease, but thinks that cases of infection by the bovine type of bacilli do occur. After a careful study and review of the subject he arrives at the following conclusions which he believes are warranted by the investigations upon human and bovine tuberculosis up to the present time:

1. The coughing consumptive is the chief source of infection.

2. The digestive tract is not the exclusive or even predominating portal of entry for pulmonary phthisis. It is highly probable that most cases are due to inhalation or aspiration.

3. In infants the bacilli probably gain entrance through all portals more easily than later in life. There are no rational grounds for believing that latency in infancy plays any appreciable rôle in the disease of later decades, but ingestion probably does play a much more important part in infantile tuberculosis, owing to habits and susceptibility of this period of life, than has been granted heretofore.

4. Bovine tubercle bacilli are found associated with a certain at present not fully calculable proportion of cases of abdominal and cervical lymph-node tuberculosis in infants and children.

5. There is at present no evidence that bovine bacilli may be transformed and assume the human type in the human body.

6. The discharge of tubercle bacilli into the milk of cows may take place abundantly in udder tuberculosis. In a small proportion of manifestly tuberculous cows without evidence of udder disease, it may take place at times in very small numbers.

7. A reasonable restriction of bovine tuberculosis below the danger limit to man is possible with the aid of tuberculin and segregation, and the removal of clinical cases and of udder disease. An eventually complete elimination can be brought about in this way in any herd, provided other domestic ani-

mals, such as pigs, cats, and dogs, are kept under control as possible reintroducers of the infection.

8. The complete elimination of bovine tuberculosis may be hoped for in the distant future. An active cooperation of individuals with municipal, State, and national forces, by exerting a steady pressure and diffusing more knowledge among farmers as to the nature of tuberculosis and the use of tuberculin, may lead to its final disappearance.

The outlook concerning a specific therapy in tuberculosis.—In the same article Theobald Smith deals concisely with this subject from the experimental and comparative standpoint. He states that—

It is now pretty generally understood that serum therapy is a method of transmitting one or more antibodies, produced in some animal artificially, to the patient in order temporarily to fill a gap—to provide a substance which is wanting, but essential in the struggle against the disease. This want is filled by the serum until the body has sufficiently recovered to manufacture for itself an antibody. The use of serums is most successful in rapid toxic diseases in which there is only toxin to be disposed of, but no bacteria. When we come to the slower invasive disease, like tuberculosis, the injection of a therapeutic serum would have to be made over long periods of time, because its need would be continuous. But even then it is a question whether the serum would be of any permanent benefit, because to throw off the disease the body must finally make its own antibodies. The serum is like a crutch, which must sooner or later be given up when the patient is strong enough to try walking alone. Approaching the subject from the practical side, we know that no serums have proved to be of any generally recognized value in the treatment of invasive diseases. The immunization of large animals is slow and difficult, and it can be carried only to a certain point. Then, again, the repeated injection of foreign serum over a long period is not to be looked upon lightly.

From both the experimental and the practical standpoint, the outlook for serum therapy is not encouraging, though I should not wish to say that it is hopeless.

Owing to the difficulties, both theoretical and practical, surrounding the use of a curative serum, investigators have again turned to the method of inducing active immunity. This consists in stimulating and rousing the latent activities of the diseased body to produce its own antibodies. Begun with the introduction of the old tuberculin by Koch in 1891, it has had various fortunes, but it seems again fairly well established to-day. All the methods are based upon the introduction into the body of the products of tubercle bacilli.

The presence of tuberculosis indicates that these antibodies are below normal, or have been at some time in the past. These considerations suggest the use of very small doses of the stimuli, and only at the proper time. Sir A. E. Wright maintains that in the antibodies known as the opsonins we have such a guide, and the index of this guide is phagocytosis. Some are inclined to neglect this guide and utilize clinical symptoms in the treatment.

In the practical development of this mode of treatment by gradual, cautious stimulation many substances have been used, all of them derived from the tubercle bacillus. The old tuberculin comes first in the order of time; next the new tuberculin, representing ground-up bacilli; then there are the watery extracts of tubercle bacilli used by Maragliano, the filtrates of the culture fluids as used by Denys, and lastly the mystical tulase of Behring. Whatever may be the perfection to which these methods of active immunization may be carried in the future, there still remains the unknown quantity of the capacity of the

individual patient to produce the necessary antibodies and bactericidal forces. If these are lacking, therapy is powerless to check the disease.

1. Serum therapy is at best a temporary palliative method in infectious diseases which are long drawn out, and which must finally be met by the specific resources of the body itself.

2. There is need of discriminating power on the part of the practicing physician between individual and individual in the application of remedies which stimulate the production of antibodies. He is evidently not going to be eliminated by an advance in medical science. In fact, he must be better trained than ever, especially in the fundamental principles of immunity—a subject quite new, but already rich in acquisitions, which may be called the physiology of the infectious diseases.

3. To each human being are given certain talents to husband and develop and not to squander, for therapy can not add to them. It falls to the lot of the physician to discover during disease the size of those hidden talents, if he can, and to utilize and manipulate them in the best interests of his patient.

The second of the two articles previously referred to deals more particularly with tuberculous infection through food and contact, and with the relative importance of the alimentary canal as a portal of entry for the tubercle bacillus. This article appears in the American Journal of the Medical Sciences, for October, 1907, and is written by M. P. Ravenel. After dealing with the historical review of experimental work, he takes up the question of the portals of entry of this disease. He believes that the tonsils serve as portals of entry of tubercle bacilli, being so situated as to come in contact readily with food as it is swallowed and being exposed to the secretions of the nose and naso-pharynx. He quotes Grober, who, after a thorough study of the question, concludes " that infection through the tonsil is the most frequent origin of apical tuberculosis." His experiments have demonstrated that from the cervical glands there is a direct route to the pleuræ and lungs, and that this leads especially to that portion of the lung most frequently the primary seat of tuberculosis—the apex.

Intestinal tuberculosis.—Pathologists give the most contradicting reports as to the frequency of primary intestinal tuberculosis. It is impossible to explain satisfactorily the widely differing findings, coming as they do in some instances from hospitals in the same city. The susceptibility to infection through the intestine unquestionably varies with the age of the individual. In young children it is more liable to injury and infection. In the great majority of cases the lesion is unquestionably secondary, and due to swallowing sputum ladened with tubercle bacilli. This does not, however, preclude the possibility that the pulmonary disease was caused in the first place by tubercle bacilli which gained entrance to the body through the intestine. In other words, the location of the primary lesion, on which so much stress has been laid, does not indicate with certainty the point of entrance of the invading organism. This appears to be especially true in children, in whom tuberculosis tends to become rapidly generalized. It is believed by many pathologists that the tubercle bacilli is able to penetrate the normal mucous membrane of the intestine without leaving any lesion at the point of entrance. This passage of bacilli through the intestine appears to be most likely to occur during the digestion of food, as shown experimentally. Some investigators confirm the observation that tubercle

bacilli readily penetrate the intestinal wall without leaving a lesion, and have traced the bacilli and find that as soon as they reach the chyle vessels they are taken up by the leucocytes, finally reaching the thoracic duct, and through it the circulation, the lungs becoming involved secondarily.

Ravenel has isolated from the mesenteric glands of a child who died of tuberculosis meningitis, following primary intestinal infection, an organism which showed all the characteristics of the bovine bacillus. A number of investigators have reported similar instances.

The opportunities for the inhalation of the bovine tubercle bacilli by human beings are slight, except, perhaps, for persons who habitually care for cattle, and, compared to those for ingestion, are insignificant. There is practically no possibility for the inhalation of bovine bacilli by children, even if we admit that the aspiration of particles of food may occur. We are therefore justified in concluding that in those cases from which the bovine bacillus has been isolated the infection has taken place through the digestive tract.

Infection through contact.—It is impossible to state how frequently contact is concerned in the spread of tuberculosis. In the great majority of cases of infection by this means the source is never suspected. Contact plays an important part in the spread of many other diseases, and is probably more frequently the mode of infection in tuberculosis than we believe.

This writer arrives at the following conclusions:

1. The alimentary tract is a frequent portal of entry for the tubercle bacillus.
2. The tubercle bacillus is able to pass through the intact mucous membrane of the alimentary tract without producing a lesion at the point of entrance. This takes place most readily during the digestion of fats.
3. The bacilli pass with the chyle through the lacteals and thoracic duct into the blood, which conveys them to the lungs, where they are retained largely by the filtering action of the tissues.
4. Infection through the alimentary tract is especially frequent in children.
5. Milk from tuberculous cows is the source of infection in many cases. Our present knowledge does not enable us to state the exact proportion of cases of tuberculosis due to this cause, but it is probably considerable.
6. Tuberculosis can be communicated by contact, such as kissing, soiled hands, accidental injuries in post-mortem work, or during the cleansing of vessels used by consumptives, etc. These modes of infection play a comparatively small part in the dissemination of the disease.

THE USE OF TUBERCULIN IN THE EARLY DIAGNOSIS OF TUBERCULOSIS.

Hawes and Floyd in an article in the Boston Medical and Surgical Journal, May 30, 1907, maintain that in selected cases the use of very small doses of tuberculin will enable the physician to distinguish between debility and anemia due to tuberculosis and that due to other less important causes, and that such use is, in their experience, attended by no danger, but is in fact of material benefit as a measure of treatment. They quote in this connection, however, adverse opinion held by Knopf, and also the statements of Billings and Janeway, pointing to the necessity of extreme caution in its use and its limitation to a certain class of cases. Used in a small dose and

in patients with no febrile movement, no kidney disease, and no evidence of advanced or moderately advanced disease, the writers believe it is entirely safe. Fatal results have followed the use of tuberculin in cases of Addison's disease. It is not intended to be used in cases in which a diagnosis of tuberculosis may be made in other ways.

The writers use Koch's Old Tuberculin, which in 2 c. c. bottles cost about 50 cents. One-half per cent carbolic acid is used as a diluent. A 1 c. c. glass pipette graduated into tenths of a cubic centimeter is needed. Beakers, large and small, a 10 c. c. and a 100 c. c. graduate, glass-stoppered bottles in which to keep the solutions and a 2 c. c. glass subcutaneous syringe must be provided, as well as a sterilizer in which all this glassware is boiled prior to use. The accurate measurement of small amounts of fluid with the pipette is a rather delicate matter and should be practised with water before trying with the tuberculin. Some of the crude tuberculin is drawn up into the pipette and 0.1 c. c. (100 mgm.) is allowed to drop into 10 c. c. of the carbolic solution. This forms solution No. 1, each cubic centimeter of which contains 10 mgm. of tuberculin. After shaking thoroughly, 1 c. c. of this is mixed with 9 c. c. of the carbolic, thus forming solution No. 2, each cubic centimeter of which contains 1 mgm. of tuberculin. This is shaken, and again 1 c. c. is mixed with 9 c. c. of the carbolic, forming solution No. 3, of which each cubic centimeter equals 0.1 mgm. These three solutions, if tuberculin is used at all extensively, should be labelled and kept on hand. A solution will last two weeks if kept in a cool, dark place, but it is better if possible to make it up fresh each time. With the solution ready a spot on the patient's back, usually under one shoulder blade, is cleaned with alcohol or corrosive, and the initial dose of 0.1 mgm. injected. This can either be 1 c. c. of solution No. 3, or, if the syringe allows of sufficient accuracy, 0.1 c. c. of solution No. 2. Many advise beginning with the dose of ½ mgm. or with 1 mgm. but consider that 0.1 mgm. is too small. The writers have seen reactions in strong, afebrile adult patients after an injection of ½ mgm. of tuberculin which were far too prostrating to be safe to the patient or advantageous to the physician. It takes very little longer and may save the patient much inconvenience to find out whether or not he will react to the smaller dose before trying the larger. One of the most violent reactions was after an initial dose of 0.1 mgm.

Lowenstein and Kauffman describe a very interesting German method of using tuberculin for diagnosis. They do not increase the dose where no reaction follows a small one, but beginning with the dose of 0.2 mgm. repeat this four times at three-day intervals before increasing the dose to 2, 5, and 10 mgm. They maintain that the small repeated doses of tuberculin sensitize the patient so that as

definite a reaction is obtained as with a much larger dose, but with less violent symptoms. Out of 300 cases, the great majority reacted to the third injection of 0.2 mgm.

The various signs and symptoms which constitute reaction can be grouped under these heads:

(1) Fever (a noticeable rise of temperature).

(2) Local signs (increased cough and sputum; râles; bacilli in sputum).

(3) Constitutional symptoms (gastro-intestinal; cardiac; nervous).

In conclusion, then, the writers believe—

(1) That tuberculin is an agent of great value in the early diagnosis of tuberculosis.

(2) That it should be used only as a last resort after all other means of making a diagnosis are exhausted.

(3) That it should be used only in carefully selected cases as specified above.

(4) That it should be given by men properly trained and qualified to do this work.

(5) That used in selected cases in the initial dose of not over 0.1 mgm. it is not in any way dangerous.

(6) That it is perfectly practicable to use tuberculin to advantage and to get good and trustworthy results in an out-patient department among ambulatory patients, but it would be far better to have beds in the hospital for this purpose.

(7) That it is much easier to get good results and to give tuberculin properly if the patients are handled in groups or classes.

(8) That if a patient has a history and signs that lead one to suspect tuberculosis, and in addition to this reacts to tuberculin, he should be treated as any early case of consumption is treated, and furthermore the exact state of affairs should be explained to the patient or to his friends.

HYGIENE.

By Medical Inspector H. G. Beyer, U. S. Navy.

Ranke, K. E. "Is the production (in both living and work rooms of houses) of a climate, considered to be more healthful for Europeans residing in hot countries, necessary and technically possible?"—Arch. f. Schiffs- u. Tropen-Hygiene, 1907. Bd. 11, No. 21, pp. 667–674.

In an address delivered by Dr. Karl Ernst Ranke of Munich, at the Fourteenth International Congress of Hygiene and Demography, held at Berlin last October, the questions contained in the above title are answered in the affirmative.

Anyone acquainted with Ranke's former contributions to this most important subject of tropical hygiene and physiology will be in

a position to appreciate not only the fundamental features of his chosen work, its great general importance to tropical hygiene in all branches of colonial endeavor, but will at once acknowledge its intensely practical character in so far as it concerns the life and continued prosperity of the white man in the Tropics.

Since many valuable lessons and suggestions may be derived from a careful study of his work, that may be directly applied to life on ships cruising in the Tropics, the reviewer hopes to be pardoned for having prepared a more liberal account of Ranke's work for the readers of this bulletin than is customary.

According to Ranke, the European going into a tropical country exposes himself to two fundamentally different kinds of influences injurious to his health. The first group of these influences is mainly of a bacteriological nature, having its causes in the different animal and vegetable parasites thriving under the conditions peculiar to tropical countries and with a mode of infection peculiarly their own, and likewise in general conditions characteristic of the Tropics. The second group consists of the various climatic differences that exist between temperate and tropical climates.

Without underestimating in the slightest the importance of the first group, Ranke insists that a full and complete explanation of the facts of tropical pathology is possible only under a due and sufficient regard to both.

The injurious effect of a purely climatic nature with which alone he proposes to deal in this address[a] may, he says, be exhaustively summed up and characterized as the direct consequences of a more or less high-grade interference with the heat-elimination of the human organism. Human life, like the life of any other organism, has certain definite thermic limits. Such limits to the life of living organisms have become familiar to us from our studies in bacteriology, and although these limits with regard to the human organism may be broad, we all know that they do exist.

There is, then, a well-defined and well-characterized range of these thermic conditions of life that is different for each species of organisms both as regards extent and location on the scale. Somewhere within this range we will find an optimum point, under which the most energetic manifestations of life and its activity will occur. As we proceed from this optimum point in the direction toward either one of the extreme limiting points of this range the manifestations of life decrease and, when either of the limits are passed, life must cease altogether and actually does cease in all the higher animals.

[a] This is exactly why it becomes of importance to naval life and why the results of his work would become applicable to it for, while we cruise in the Tropics, we are under the climatic influences of the Tropics without being, to an equal extent, exposed to the bacteriological group of these influences.—Rev.

Such a temperature range exists also for man, in spite of the fact that it has not as yet been explored in all its varied details. Since an accurate understanding of what is meant by temperature range is fundamental to an understanding of what follows in this review it may be necessary once more to mention that the term temperature range, as here used, is not intended to convey merely an idea of the variations of atmospheric temperatures alone, but that it is meant to include the total thermic effect of the environment and which is made up of all the so-called climatic factors, such as atmospheric temperature, humidity, movements, and pressure, as well as radiated heat.

Those of the climatic factors that facilitate the heat elimination of the human organism will cause a reduction of the human temperature range near its lower limiting point, and, on the other hand, every factor tending to make heat elimination from the human organism more difficult will cause this range to shrink near its upper limiting point. Thus, for instance, wind will reduce the extent of the lower limb of the range while it will enlarge the extent of the upper limb of the same.[a] This means that we can bear very low temperatures in a quiet atmosphere which become at once intolerable and injurious with an increase in the chances for heat elimination by the winds; on the other hand, we are able to bear very high temperatures in consequence of the increased facilities for heat elimination through conduction and water evaporation from the skin, caused by the same winds and which temperatures would, in a quiet atmosphere, quickly become intolerable and, consequently, injurious. In brief, atmospheric movements or winds tend to displace the human temperature range in an upward direction.

Atmospheric humidity, which is of the greatest hygienic importance in this connection, cuts short the human range at both ends. In a dry atmosphere we are able to bear higher as well as lower degrees of temperature than in moist air; temperatures that would, in moist atmosphere, cause the most serious consequences, are borne without the least disturbance to heat elimination in a dry atmosphere.

The white man in the Tropics finds himself in a climate the total thermic effects of which correspond to the upper limit of his temperature range. The effect of such climates are dependent on the degree and the duration that heat elimination is interfered with, and we know that any such interference, no matter how slight in degree nor how short in time, will invariably be quickly followed by very distinct and noteworthy signs of impairment of health.

In case the climatic value rises very gradually above the optimum point, the human organism calls into requisition its physical powers

[a] For further information consult article on Naval Hygiene, Woods Ref. Handbook of the Med. Sc's, by H. G. Beyer.

for heat elimination: the capillaries of the skin become dilated, heat is eliminated through conduction and radiation; the sweat glands become active and heat is eliminated from the surface through the increased water evaporation. Such means, for short periods of time, are a great aid. But for purposes of forming a true, accurate, and reliable estimate of the influence upon health of a climate, in which the optimum point of the range is permanently surpassed for longer periods, we must steadily keep in mind that physical heat regulation means a very considerable strain on vitally important organs, notably the *heart* and *nervous system.* We will now also be able to understand, without further explanation, why our organism, almost instinctively, strives to avoid physical heat regulation for more than short periods of time. Ranke, the highest authority on this point, attaches the greatest physiological importance to this phenomenon and holds that, without its due appreciation, the riddle as regards the effects of climate can never be solved.

Climates in which the total thermic effect is such as to surpass the optimum point of the human range for prolonged periods will cause two kinds of injurious effects, namely: (1) They will give rise to fatigue and exhaustion of the organs most concerned in physical heat regulation, as the heart and nervous system. Instances of this fact stand abundantly recorded in the Tropics and have been described as occurring in both peace and war times. In this same category also belongs the tropical sleeplessness caused by the strain on the physical heat-regulating mechanism kept up even during the night; (2) these climates will give rise to an instinctive limitation, on the part of the human organism, of heat production, consisting in a voluntary reduction of muscular activity and in the taking of less nourishment than would ordinarily suffice to maintain the organism in a state of robust health.

That in the Tropics the amount of voluntary work is lessened needs no further proof, and that this is the direct consequence of the increased difficulty placed on normal heat elimination is also a well-known and well-established fact. That the amount of nourishment, voluntarily taken, is decreased under the influence of a tropical climate on white men, and that this decreased intake is directly dependent on the total thermic effect of the climate has been scientifically and quite conclusively proven by Ranke himself in a most painstaking and self-sacrificing series of experiments in the Tropics on his own person. Ranke has, moreover, shown that this decreased desire for nourishment in hot countries is not accompanied by a decrease in the physiological needs of the human organism, and that consequently the normal state of health is bound to suffer in the long run. He has shown that it is not analogous to a chemical regulation or that, in other words, life in the Tropics was possible on less nourishment than

is required elsewhere, but that it is due to the necessity for a decreased heat production. The impossibility of eliminating the surplus of the heat produced by a healthy normal organism compels that organism to restrict not only the activity of the organs most essential to its existence, but also to take less nourishment than it actually needs.

This conflict between heat and energy balance, produced by a climate that surpasses the temperature-optimum of the European, is a phenomenon belonging to the domain of physiological pathology. It is entirely without serious consequences for short periods of time. It does not injure anyone to do less work or to eat less for a few days than he does ordinarily. But when prolonged for months or years a change of altitude or, where that is not possible, a change of latitude becomes absolutely necessary for the purpose of bringing about a return to normal conditions.

The conception of the necessity for the recuperation of the neurovascular mechanism concerned in heat economy is hygienically mandatory. Its practical importance to this problem is clearly illustrated in the work and life of miners. These men often perform the hardest kind of labor for many years under conditions of temperature, humidity, and radiated heat, the total value of which approaches and sometimes even surpasses that of the most unfavorable tropical climate. This endurance is made possible by the fact that these men do not spend the entire day in such an environment, but live two-thirds of it under conditions that allow the organs engaged in physical heat regulation time to completely recover. The hot nights of the Tropics do not here come into play.

But that even in spite of the chances for frequent recuperation the state of health of these men depends on the degree of interference with the heat economy is shown by the fact that miners, who work in shafts where high humidities prevail, are invalided on the average ten years sooner than those working in shafts with dry atmosphere. From this it will be seen that there still is left a remnant of danger to the health of the European in the tropics in spite of frequent chances for recuperation.[a]

It is one of the problems of hygiene to study and fight these conditions and anything by which heat elimination is facilitated becomes of the greatest value in this struggle.

Our endeavors so far have been devoted chiefly to devising means for lessening the amount of radiated heat and for creating air cur-

[a] The similarity of the life of miners to the life of the men on warships, especially those engaged in the lower compartments and excepting, of course, the depth, is indeed more real than apparent. Therefore might not a study of the climatic conditions presented by some of the interior compartments of our ships in their relation to morbidity and mortality records result in valuable data with regard to the effects produced and the means of counteracting them?—Rev.

rents by either natural or artificial contrivances. Ranke's endeavors are to facilitate heat regulation directly and not merely to relieve an extra burden on the heat mechanism by both cooling and drying the air. Both these objects can be attained by means of a simple refrigerating machine. When the air is cooled down to a lower temperature, it looses a certain amount of water, and after this same air is again heated to a more comfortable room temperature it becomes a relatively dryer air than it was before.

A perfect working model, made at Ranke's suggestions and showing the practical application of the above principles, was exhibited in the Reichstags's building during the last Congress of Hygiene and Demography at Berlin. The model was intended to represent the "Nachtigal Hospital" in Togo. A system of pipes is kept constantly at a certain desired degree of low temperature by means of an ordinary ammonia-ice machine. The air for ventilation, taken from a place above, is made to pass around these pipes by blowers. The temperature of the passing air is gradually lowered down to that of the pipes which, of course, *must have a lower temperature* than that desired for the living rooms and which this air is later intended to supply. After giving off water during its passage along the cold pipes, the air is warmed again up to the desired room temperature. The blowers now drive the air into provided conduits, located near the ceiling and communicating by openings with the room below. The slight overpressure under which the dried air enters the room is intended to counteract the losses that naturally occur through open or imperfect joints and seams of doors and windows and through the porous walls of masonry. By its own gravity the cool and dry air sinks, and thus displaces the warmer and lighter air of the room.

In this simple manner it becomes possible, in any climate, to produce such a combination of climatic conditions as will be most favorable for normal heat economy.

That even the provision of such rooms for the night hours alone would be productive of much improvement in the conditions of life in the Tropics for Europeans has been seen and amply illustrated in the example of the miners. The practical application of the principle, therefore, presents neither new nor any technical difficulties.

Ranke concludes his very important address by saying that "theoretical prejudices and the laws of inertia of long existing conditions alone could have, up to the present time, prevented the practical application of these technically perfect means, directed against the injurious effects of tropical climates."

BUBONIC PLAGUE.

The New York Medical Journal of June 15, 1907, publishes "Some notes on bubonic plague as seen in Siam," by C. S. Broddock, and the article is of interest as a suggestion to those concerned in sanitary

operations against this historic and devastating disease. Three of Broddock's observations attract our attention—one bearing upon the dissemination of the disease, another upon prophylaxis, and the third upon diagnosis.

He expresses it as his experience that the vehicle of first importance in the dissemination of infection is the rat; second, the flea; third, the bedbug; fourth, the mosquito; and fifth, the fly, and believes that, aside from personal infection in the pneumonic form of the disease and infection from the soil of those going barefooted, the danger of spread can be greatly lessened in direct proportion as the parasites in the order mentioned are destroyed in the infected locality.

In respect to prophylaxis Broddock credits coal oil with the peculiar virtue of effectually repelling fleas, and he cites as a practical demonstration of this alleged influence the fact that the coolie employees of the oil companies in Bombay and Calcutta were found not to contract the disease, which was raging all around them. Acting upon this observation he always used a liberal quantity of coal oil on his shoes and stockings and leggings at times of his attendance upon patients, and he exacted a compliance with this measure on the part of attendants to the extent of rubbing coal oil over their entire bodies twice daily. Moreover, he goes on to say, as a final measure to effectually stop the spread of the disease after the usual disinfection and sanitation had been accomplished, all floors and furniture were washed with crude coal oil, and it was also sprinkled freely under the houses and over the ground in their vicinity.

Though Broddock regards medicine as of little or no use in combating the disease he found quinine of value as an aid to early diagnosis and employed it in 20 to 30 grain doses with suspects to exclude fever from other causes. In this connection, he states that if six hours after such an administration the fever had fallen the slightest degree it was regarded as not being a case of plague.—(W. H. B.)

PROPHYLAXIS IN EPIDEMIC CEREBRO-SPINAL MENINGITIS.

That this disease is communicable is a fact established beyond discussion, and the germ which causes it has also been identified to a certainty. The question of prevention represents a problem the solution of which is of the utmost importance to all who come in contact with this disease or face the possibility of its appearance, as is the case with the naval surgeon. Doctor Seibert's consideration of this disease, under the above title (Jour. Am. Med. Ass'n, Nov. 16, 1907), is of extreme interest. He opens his article with a citation of statistics which show the location and colonization of the meningococcus intracellularis to be in the naso-pharynx in a very large percentage of patients, and intimates that the now well-known biology of the

organism makes it unlikely that it survives to do harm outside of the body. The essence of our present information concerning the epidemiology of this disease is then summarized as follows: First, epidemic cerebro-spinal meningitis is communicable only by direct contact with fresh mucous from the naso-pharynx of patients; second, the person who has taken the germ from a patient may acquire meningitis; third, such a person may only acquire meningococcus pharyngitis and thus, acting as intermediary host, carry the infection to others near and far.

With such introductory remarks the key to prophylactic measures is presented in a quotation from Kutscher: "It is necessary by all means to find a therapeutic remedy which will kill the meningococcus in the nasopharyngeal mucous," and, as added parenthetically by Seibert, "Not alone in the mucous, but also in the mucosa." It seems to be held by most authorities that the usual methods of disinfecting the nasopharynx of persons exposed to contact infection—by gargling, spraying, and swabbing—do not seem to accomplish this result, probably because the disinfectant does not reach the bacteria in the mucosa. Deep penetration by the disinfectant is therefore necessary, and with this understanding Seibert goes on to detail a method which, in his experience, seems to have been effective, judged both by clinical and laboratory evidence.

Briefly he employs a solution of equal parts of resorcin and alcohol to disinfect the nasopharynx, the alcohol being heated before the resorcin is added. The solution is introduced high into the nasopharynx on a plug of absorbent cotton by means of an applicator, bent so as to suit the length of the respective nasopharynx. Swabbing, it is said, is not necessary, and two applications of two seconds duration, one passed each side of the uvula, are sufficient for one treatment. He cautions that the stomach must be empty at the time. These applications are best repeated every forty-eight hours, six treatments usually sufficing for the purpose. In recent cases, however, two applications in one sitting usually suffice. Infants, even as young as one month, bear the treatment as well as and often better than adults.

In conclusion, Seibert proposes as a prophylactic measure in epidemics of cerebro-spinal meningitis that the resorcin-alcohol should be used: First, in the nasopharynx of the patient to prevent further absorption, as well as expectoration of meningococci; second, in all persons coming in contact with the patient, especially when post-nasal catarrh is present.

The use of Pyocyanase, a product of the bacillus pyocyaneus, has been suggested as a similar local application with reported promising results in both meningitis and diphtheria.—(W. H. B.)

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SPECIAL ARTICLES.

A PRELIMINARY REPORT UPON THE TREATMENT OF TUBERCULOSIS BY THE ADMINISTRATION OF MERCURY.

[From the U. S. Naval Hospital, New Fort Lyon, Las Animas, Colo., March 1, 1908.]

By Surg. BARTON LISLE WRIGHT, U. S. Navy.

In forwarding and commenting upon this report Medical Inspector C. T. Hibbett, U S. Navy, says that the subject is engaging the earnest attention of the officers on duty at this hospital, and the treatment is being carefully applied personally by Surgeons Bucher and Wright, in order that there may be no danger of infection by the needle to discourage the patients. The clinic is steadily growing by voluntary applications for treatment. The results of treatment so far strongly encourage the hope that we may have in mercury a specific for tuberculosis, its action probably being the same as in the closely allied pathological conditions in syphilis. The possible suggestion that the cases mentioned in this report are syphilitic or of mixed infection would not be accepted at this hospital, as every effort has been made to demonstrate the presence of syphilis without success.

In the spring of 1905, during the latter part of my tour of duty at the United States Naval Hospital, Pensacola, Fla., where the Bureau of Medicine and Surgery had established a temporary camp for the treatment of tuberculosis, I had under my care, among the other patients, several tuberculo-syphilitics, and my attention was drawn to the fact that the pulmonary lesions of these patients improved much more rapidly than I had ever observed in unmixed tubercular infections under simliar or more advantageous climatic conditions.

From my observations I was led to believe that the antisyphilitic treatment administered was the causative agent in the improvement of the tubercular pulmonary lesions in these cases. With this idea in view I placed some ten men on mixed treatment: Hydrargyri chloridi corrosivi grm. 0.00325 (gr. 1/20) and potassii iodidi grm. 0.324 (gr. v.) T. I. D. in water, and the prescription was administered under the name of X treatment, to meet the existing prejudice against mercury. These men all improved to the point where the medicine began to derange the gastro-intestinal tract, and it had then, for that reason, to be discontinued. Before I could continue the experiment further I was detached from duty and ordered to sea.

When we began to receive patients at this hospital, about September, 1907, I mentioned my experience with mercury to my colleague, Passed Asst. Surg. E. M. Brown, then in charge of the treatment of patients, who tried it in several cases with indifferent results, for the

reason, I now believe, that the dose of mercury given was not sufficiently large. That this explanation is correct seems demonstrated by the fact that later, when the same patients were placed on larger doses, an immediate and decided improvement took place.

Upon the reporting of Surg. W. H. Bucher, on December 9, 1907, I had a long conversation with him on this subject, and he assured me of his enthusiastic support in carrying out the experimental investigations as to the efficacy of mercury in the treatment of tuberculosis. It was determined that the mercury was to be administered by deep muscular injections, and when the plan of our proposed studies was laid before the commanding officer, Medical Inspector C. T. Hibbett, it received his prompt and hearty approval.

Upon Doctor Bucher's advice hydrargyrum succinidum was the preparation of mercury selected for the purpose, as it had given him better results in the treatment of syphilis than any of the other mercurial combinations, and the necessary steps to secure both the succinimide and the special hypodermic syringes required for our purpose were at once taken.

Early in January we were very much encouraged, and our confidence in this method of treatment confirmed by seeing in the Journal of the American Medical Association, December 28, 1907, the following abstract of an article written by Doctor Wolters, of Germany:

PRIMARY TUBERCULOSIS OF THROAT CURED BY IODIN AND MERCURY.

Wolters, in Derm. Zeitschr. for September, reports the case of a previously healthy woman of 33 with four healthy children, who suddenly began to experience pain in throat, but no hoarseness or cough. Local applications of lactic acid and potassium iodid internally gave no relief and inoculation of animals showed the unmistakable tuberculous nature of the lesions as they developed later. Potass. iodid. was pushed, the patient taking 3 grm. a day and improvement was soon evident. Mercury salicylate was then injected subcutaneously and complete recovery soon followed. He emphasizes the fact that primary ascending tuberculosis of the upper air passages must not be confounded with lupus or syphilis, and that the recovery under treatment, with potass. iodid. and mercury, must not be accepted as establishing the syphilitic character of the lesions.

The following cases are submitted:

Case No. 1. This patient had advanced lesions of the entire area of both lungs, advanced tubercular ulcerations of the upper larynx, pharynx, naso-pharynx, and a perforating tubercular ulcer of the soft palate. We had expected to administer injections in this case, but the syringes had not yet arrived, and, as he was thought to be in such a condition that death might occur in a few days, it was determined to administer mixed treatment by mouth. The prescription was composed of hydrargyri corrosivi grm. 0.00541 (gr. 1/12) and potassii iodidi grm. 0.648 (gr. x) in compound tincture of gentian and was given T. I. D. This treatment was instituted on January 17, 1908. The complete record of the case follows:

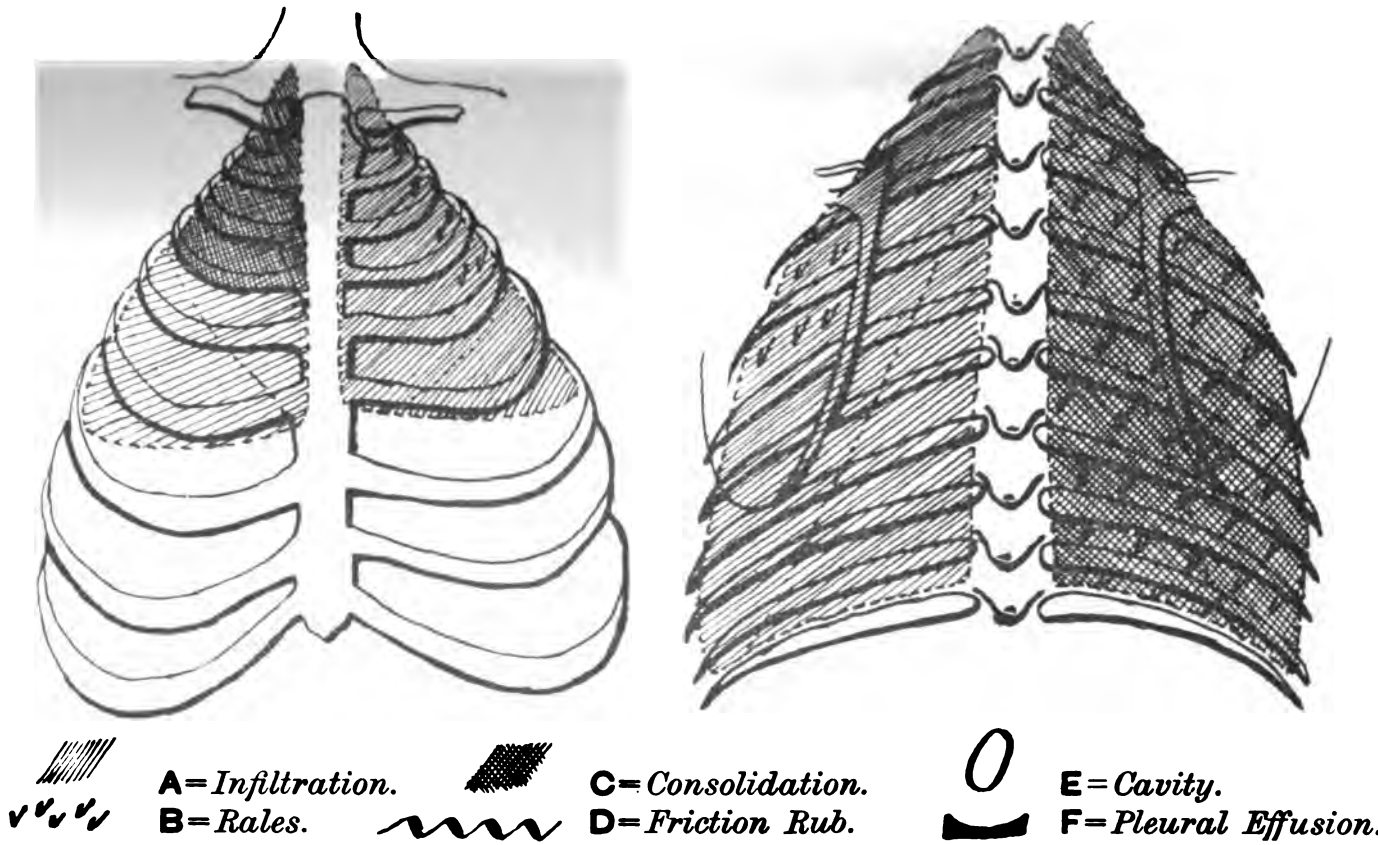

FIG. 1.—CHART SHOWING LUNG INVOLVEMENT OF CASE 1 ON FIRST EXAMINATION AFTER ADMISSION.

TEMPERATURE CURVE.

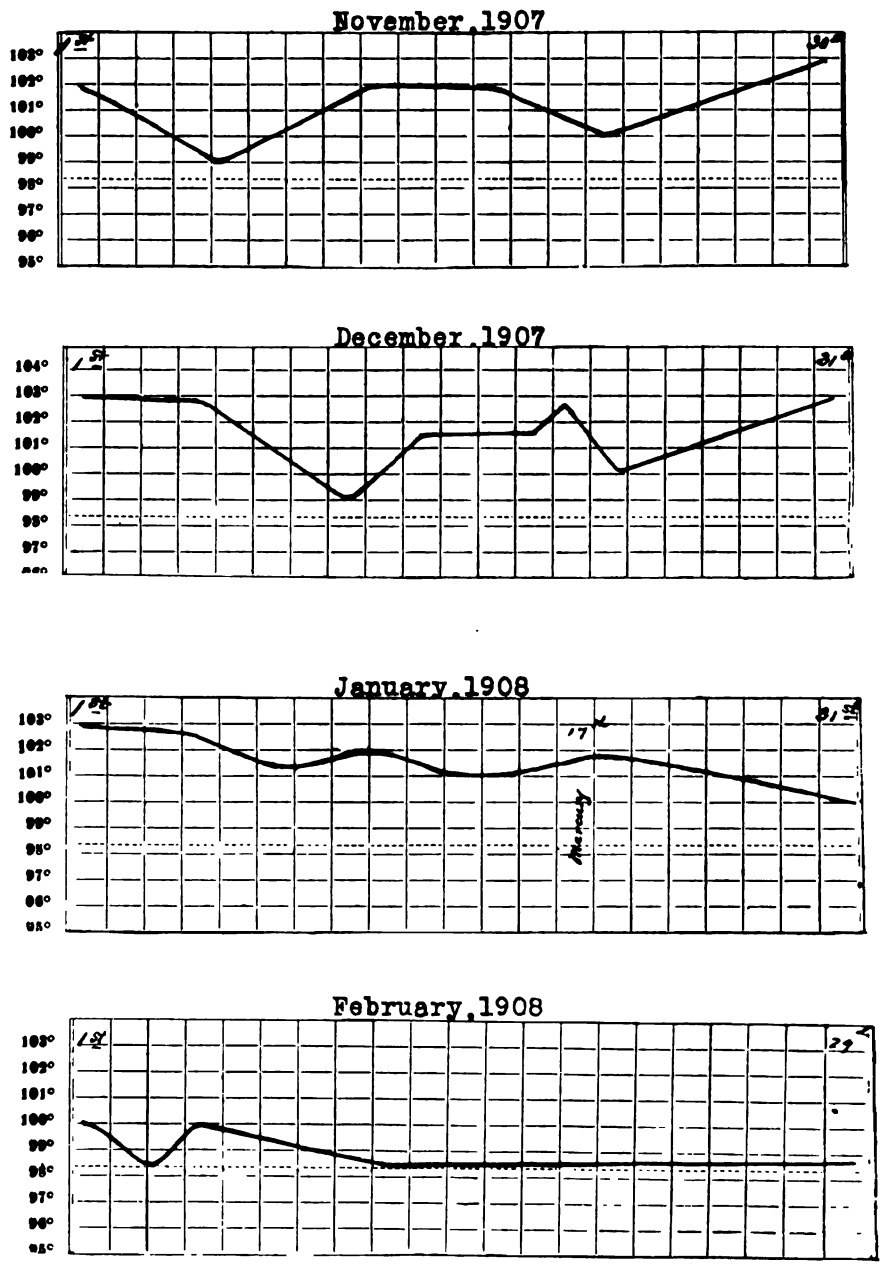

FIG. 2.—CHARTS REPRESENTING THE 5.30 P. M. TEMPERATURE RECORD OF CASE 1 FROM DATE OF ADMISSION, WITH PARTICULAR REFERENCE TO THE DECLINE AFTER MERCURIAL TREATMENT WAS INSTITUTED.

[Abstract from the hospital ticket, dated: Naval Hospital, New York, October 26, 1907.]

Patient has had a cough with progressive loss of flesh and strength for several months. There are signs of consolidation at both apices and scattered areas of diminished resonance in both lungs, most marked over lower right lobe in posterior axillary line. There is evening rise of temperature, profuse expectoration and large numbers of tubercle bacilli in his sputum. There is a small swelling on right side of tongue which causes much pain in swallowing.

On October 15, 1907, a board of medical survey recommended that he receive treatment at New Fort Lyon, Colo.

HOSPITAL RECORD.

Case paper No. 106, October 31, 1907, F. O. D. yeoman, 3d class, American, blond.

NATIONALITY.

Paternal grandparents, French; maternal grandparents, German.

FAMILY HISTORY.

Paternal grandparents, negative; maternal grandfather, negative; maternal grandmother, died at 66, cause unknown; father, died at 53 of jaundice; mother, living, in good health, in fifty-fourth year; three brothers, living, in good health; two brothers, died in infancy; one sister, died in infancy.

PERSONAL HISTORY.

Born July 10, 1879, at Pelican Rapids, Minn. Childhood diseases: Measles, scarlet fever, and diphtheria. No other sickness before enlistment. Enlisted April 7, 1905. Weight, 138. Served about one year in the Tropics; then about seven months north. In April, 1907, transferred to station ship at Guantanamo, Cuba. In May, 1907, patient contracted a cold, which persisted with considerable cough and some pain in chest. Early in June began treatment on board; but condition continued about the same, except that he gradually lost weight and strength until September 6, when he was placed on the sick list and sent north. He arrived at New York September 29; weight 123, with heavy clothes; condition improved. Sent to New Fort Lyon October 26, 1907. Smokes cigarettes a little; drinks occasionally, but never to excess.

PRESENT CONDITION.

Has much cough and expectoration at night; occasionally has pain in right side (low) on coughing. Sleeps poorly; appetite very good; constipated. Has a sore throat, presumably from a growth on tongue, which first appeared during the passage to New York about September 25. Chest inflated 32, deflated 30; weight 117¾; height 5 feet 7¾ inches; pulse 125; respiration 23; temperature 100.5.

Inspection.—Patient thin, chest flat, clavicles prominent, apices depressed, muscles flabby, mucous membranes pale, winged scapula.

Right lung, anteriorly.—Tactile fremitus about normal. Impaired resonance over the whole front of the chest. From the apex to the nipple there is tubular breathing and whispered pectoriloquy. Below this part, over the remainder of the lung, the breathing is harsh and somewhat suppressed; no râles.

Right lung, posteriorly.—Dullness over the entire area as well as rough tubular breathing; numerous râles, varying in character.

Left lung.—Diminished resonance over the entire lung. The breathing is not distinctly tubular, but broncho-vesicular in character throughout. There are numerous moist râles in the axilla.

Other organs and tissues.—Heart: Rapid, but sounds are good; penis and appendages, normal; glandular system, normal.

Pulmonary summary.—In the right lung, anteriorly, there is consolidation of upper lobe from apex almost to nipple. The process in this part of the lung seems nonactive. The remaining portion of lung is profoundly infiltrated. There is almost entire consolidation posteriorly and the process there is active. In the left lung there are no decided areas of consolidation, but it is actively infiltrated throughout.

CLINICAL NOTES TAKEN FROM THE CASE PAPER.

December 20: Doing poorly, moderate fever, throat condition bad.

December 30: Growing worse; there is a perforation of the soft palate by an ulcer.

January 7: Patient losing weight and strength constantly.

January 14: Too sick to be examined by physical diagnosis department.

January 17: Patient put on $HgCl_2$, $\frac{1}{12}$ gr., K. I. gr. X. tid.

January 22: Doing the same, soft palate œdematous, perforation the same, appetite increased.

January 30: Ulcer on posterior pharynx shows granulations; patient looks and feels better; perforation slightly increased; œdema of soft palate decreased so view of pharynx can be had. Both vocal cords are marked by ulcers, also the posterior rim of the glottis.

February 1: Hypodermic of $HgCl_2$, gr. $\frac{1}{10}$, caused excessive pain.

February 5: Hypodermic discontinued. Mixed treatment resumed.

February 12: Marked increase in weight, 4½ pounds in a week. Ulcer posterior pharynx healing, secretions diminished, Vocal cords not so congested, nearly normal in appearance. Ulcers posterior regions of glottis reduced in size.

February 14: Continues to show marked improvement. Ulcer posterior pharynx practically healed by granulation. Vocal cords normal, false cords congested, small ulcers nearly healed posterior rim of glottis.

February 22: Marked improvement. Has gained 14¾ pounds in one month. Patient has been up two hours every day.

[Physical examination report, being the result of the second examination, in bed, made February 20, 1908.]

PRESENT CONDITION.

Feels much better. Appetite good, sleeps well, bowels regular. Coughs and expectorates considerably, principally in the mornings. Throat feels much better. Temperature, 96.6 to 98.8; pulse, 85 to 105; respiration, 17; weight, 112½; chest circumference, 34½ inches; chest inflated, 35 inches; chest deflated, 32 inches; chest expansion, 3 inches.

Inspection.—Franke's striæ absent; flat and elongated chest; both apices retracted; body emaciated; muscles soft.

Right lung, anteriorly.—Myotatic reflex present. Tactile fremitus negative. Dullness to second rib. Bronchial breathing to second rib, below which point expiration is prolonged. Vocal fremitus increased to third rib. Whispered pectoriloquy absent.

Right lung, posteriorly.—Tactile fremitus negative. Dullness to fourth dorsal vertebra. Respiration somewhat suppressed generally; broncho-vesicular breathing to fourth dorsal vertebra, below which point expiration is somewhat prolonged. Vocal fremitus increased to sixth dorsal vertebra.

Left lung, anteriorly.—Myotatic reflex present. Tactile fremitus negative. Dullness above the clavicle. Broncho-vesicular breathing to third rib, below which point expiration is prolonged. Vocal fremitus negative. Whispered pectoriloquy absent.

Left lung, posteriorly.—Tactile fremitus negative. Dullness to eighth dorsal vertebra. Respiration suppressed; broncho-vesicular to sixth dorsal vertebra, below which point

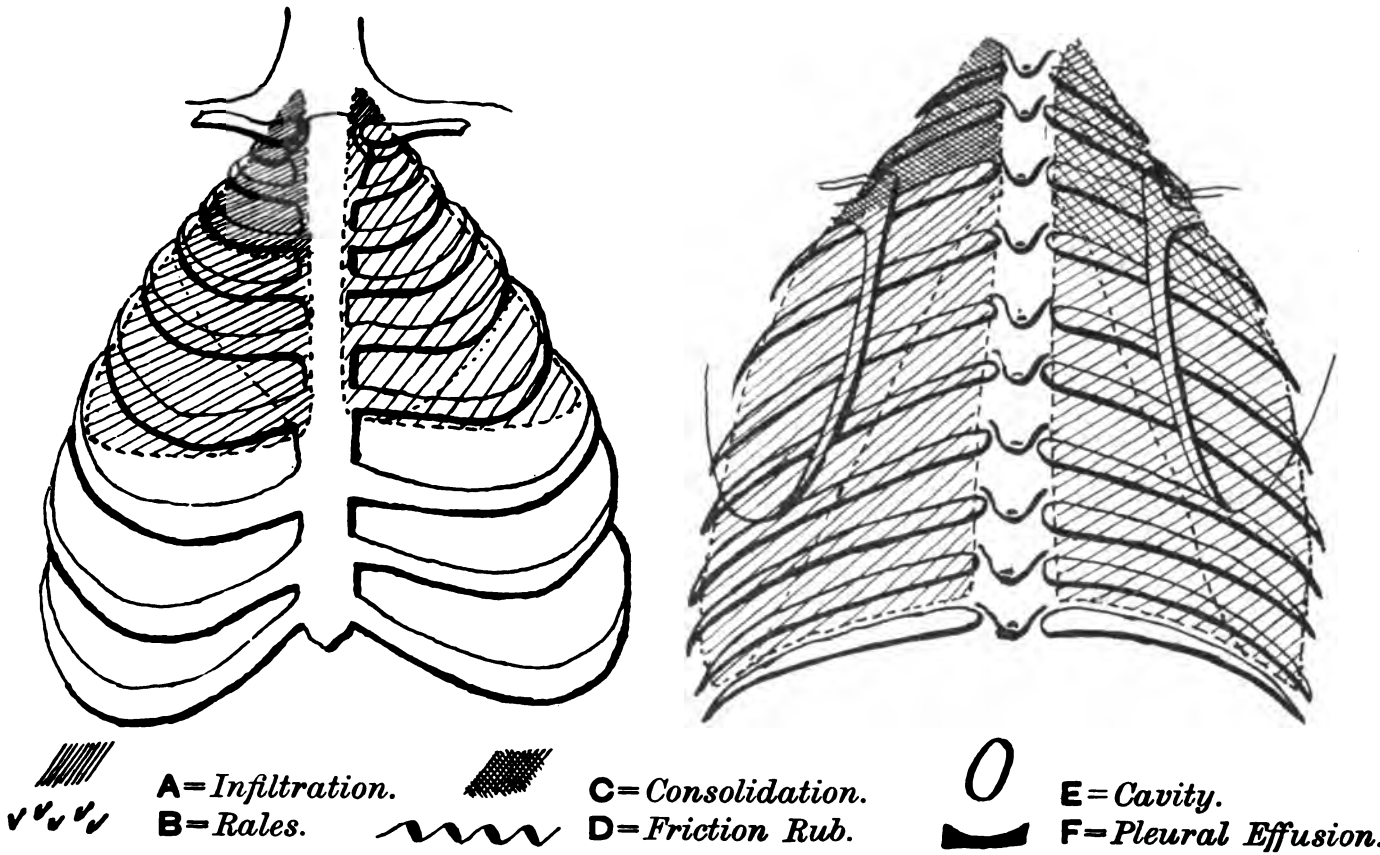

FIG. 3.—CHART SHOWING LUNG INVOLVEMENT OF CASE 1 ON FEBRUARY 20, 1908; MERCURIAL TREATMENT INSTITUTED JANUARY 17, 1908.

WEIGHT CURVE.

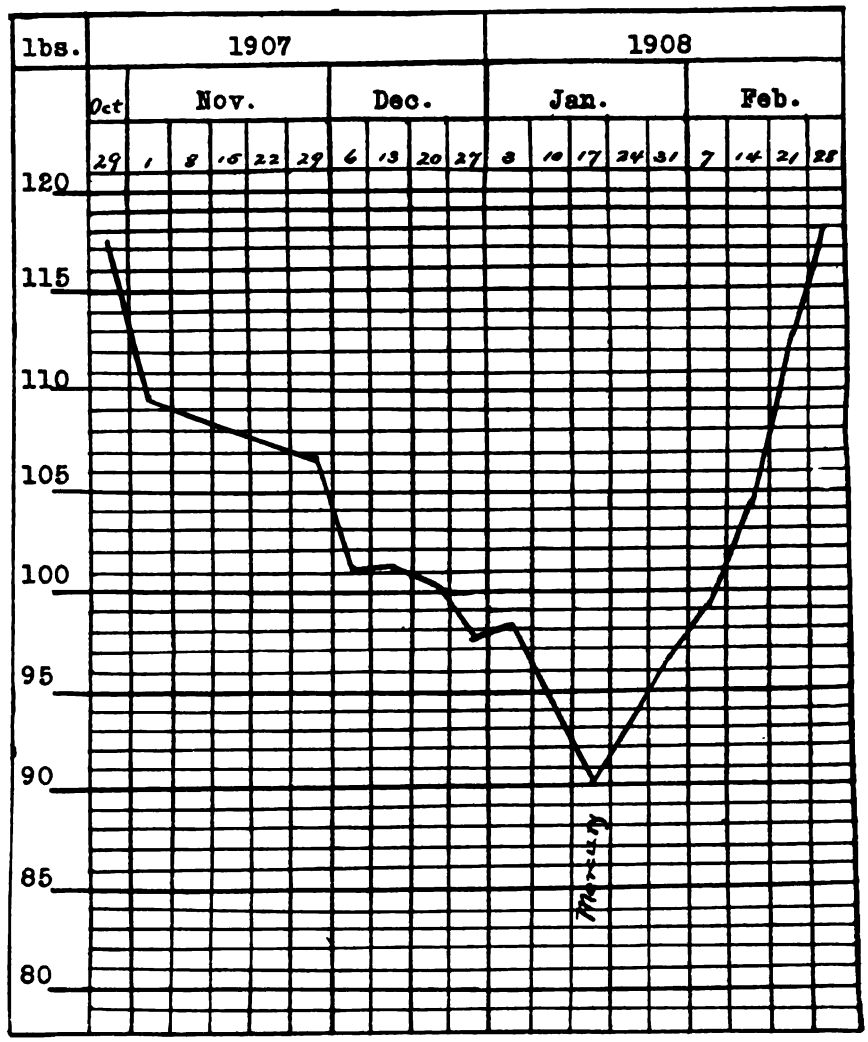

FIG. 4.—CHART SHOWING VARIATIONS IN WEIGHT OF CASE 1, WITH PARTICULAR REFERENCE TO THE RAPID INCREASE AFTER MERCURIAL TREATMENT WAS INSTITUTED.

expiration is somewhat prolonged. Vocal fremitus increased to third dorsal vertebra. Whispered pectoriloquy to third dorsal vertebra.

Other organs and tissues.—Heart, normal; liver, normal; spleen, enlarged; penis and appendages, normal; glandular system, inguinal glands enlarged; arterial system, normal.

Pulmonary summary.—Somewhat profound nonactive infiltration of right lung, anteriorly, down to third rib, below which point it is nonactively infiltrated. Slight nonactive consolidation of right lung, posteriorly, down to fourth dorsal vertebra, below which point it is nonactively infiltrated. Somewhat profound nonactive infiltration of left apex, and below the clavicle the lung is nonactively infiltrated. Nonactive consolidation of left lung, posteriorly, down to third dorsal vertebra, below which point it is nonactively infiltrated.

CLINICAL NOTES TAKEN FROM THE CASE PAPER.

February 24: Patient much better.

February 27: Ulcers of the throat entirely healed. Perforation of the soft palate remains patulous.

Sputum examination shows a few tubercle bacilli present.

Weight, 118, a gain of 5½ pounds for the week.

COMMENT.

In reading the clinical history of the above case, the first point noticed is the rapid progression of the disease from the date of admission, October 29, 1907, to January 17, 1908. During this time loss of flesh and strength was marked, the tubercular ulceration of the throat increased progressively, the pulse became weaker and more rapid, and the temperature gradually rose.

Because of the patient's serious condition, the physical examination, which should have been made on January 15, 1908, was omitted; however, taking his present condition into consideration and comparing it with that at the date of his admission, it is only fair to assume that the pulmonary lesions had advanced, and, the probabilities are, that this advancement would have been found marked, had a physical examination been possible at that time.

On January 15 the medical officer in charge of the ward had given up all hope of his life, and thought his death but a few days off. On the 17th his condition was practically unchanged, and, as detailed above, mixed treatment was instituted in lieu of deep injections which we were still unprepared to give. The amount of the bichloride in the mixture has been increased from time to time, so that he is now getting grm. 0.0082 (gr. ⅛) three times daily.

A marked improvement in his condition immediately followed—the secretions from the throat diminished, the marked tubercular ulcerations (from those in the naso-pharynx to those in the larynx) began to show evidence of a healing process, the pulse and temper-

ature improved, cough became less, the appetite improved markedly and progressively, and he was soon able to take increased nourishment.

The physical examination on February 20 showed considerable improvement in the pulmonary lesions as compared with the findings of the first physical examination, and it is probable that had an examination been possible on January 15, a comparison between these findings would have shown a more marked improvement.

On February 27 the ulcerations in the throat were found to be entirely healed, and the only remaining evidence of these was the patulous opening in the soft palate, which will be closed by operation at some future time.

On February 27 his weight was 118 pounds, which represents a gain of 28 pounds since January 17, the date upon which mercury was first administered.

When admitted, large numbers of tubercle bacilli were found in the sputum, but few are found at the present time.

This transformation from a dying condition to one of such marked improvement in so short a period of time is most gratifying, and presents many points of great interest to the profession.

Case No. 2.—The complete record is as follows:

[Abstract from the hospital ticket, dated Naval Hospital, New York, July 6, 1907.]

Both lungs involved. History of osteo-myelitis of clavicle. Naso-pharyngeal catarrh. Tubercle bacilli have been found in sputum. Transferred on approved recommendation of board of medical survey.

HOSPITAL RECORD.

Case paper No. 14, July 12, 1907, L. J., sergeant, U. S. Marine Corps, American, of Irish descent, brunette.

FAMILY HISTORY.

Knows nothing about grandparents, except that his father's mother died suddenly when in apparent health, at the age of 83. Has one uncle and two aunts living and one uncle dead. Has no brothers or sisters; but has two half brothers, both living.

PERSONAL HISTORY.

Gives no history of any of the diseases of childhood, except scarlet fever, which he had when about 8 years of age. He was born in Wilmington, Del., on January 1, 1864. First enlistment June 22, 1898, and holds a C. S. C. Last enlistment July 8, 1903. First taken sick in Cuba in 1899, when he was on the list for ten days with malarial fever. Later, after being transferred to the States, he had the fever again at Newport. Present sickness started with rheumatism in his left shoulder, in August, 1906. He went on the sick list with rheumatism in both shoulders in September, 1906. First noticed his cough in February, 1906. It began as a dry hacking cough with practically no expectoration. About December 1 his sputum was examined, and shortly afterward, during the same month, he was transferred to the tuberculosis camp at the Brooklyn Hospital, where he remained until he was sent out here. He had night sweats, when cough developed, and lost weight and appetite. Drinks some, but never excessively; smoked until May and then stopped, because it hurt his throat; inveterate chewer of tobacco.

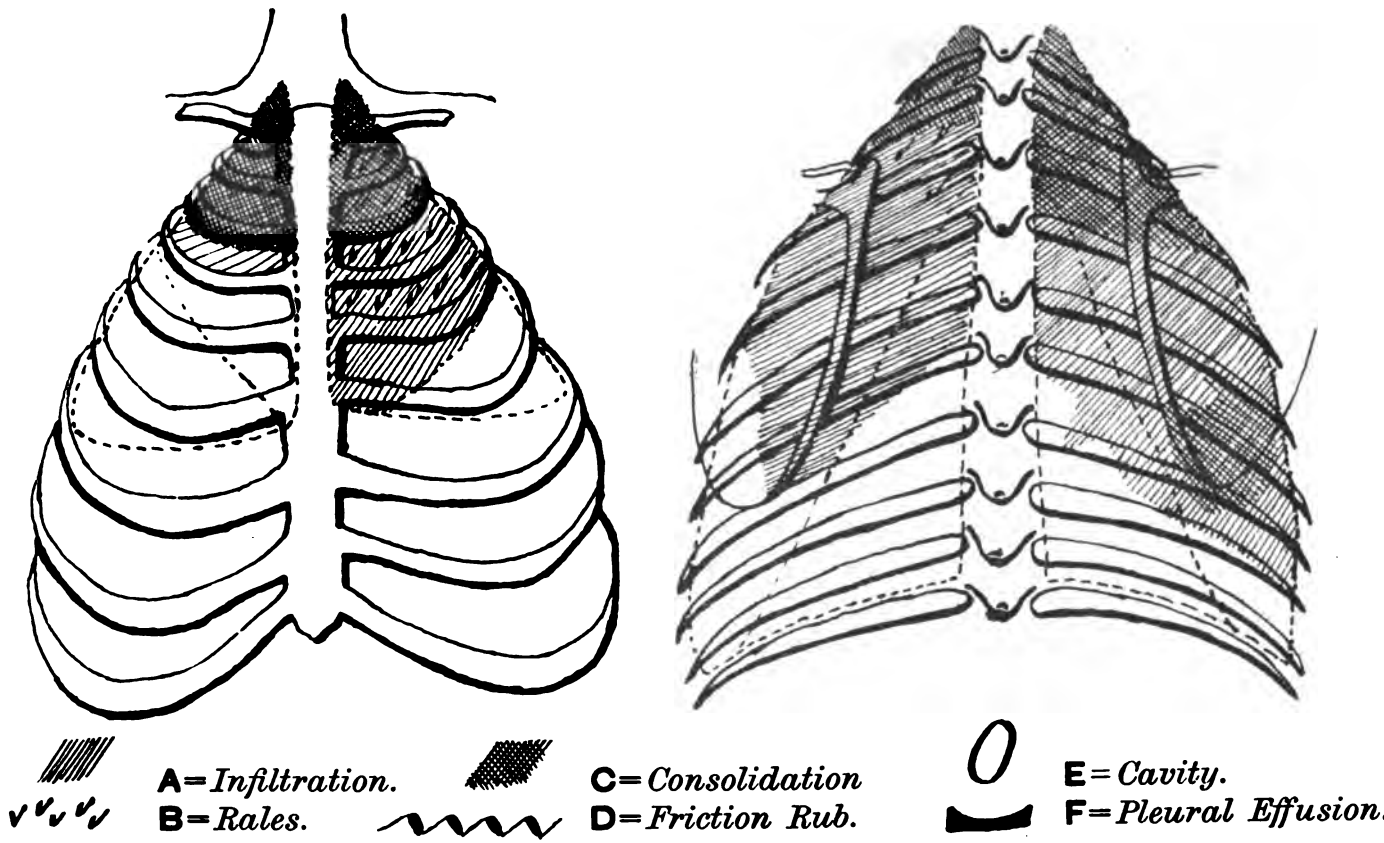

FIG. 5.—CHART SHOWING LUNG INVOLVEMENT OF CASE 2 ON FIRST EXAMINATION AFTER ADMISSION.

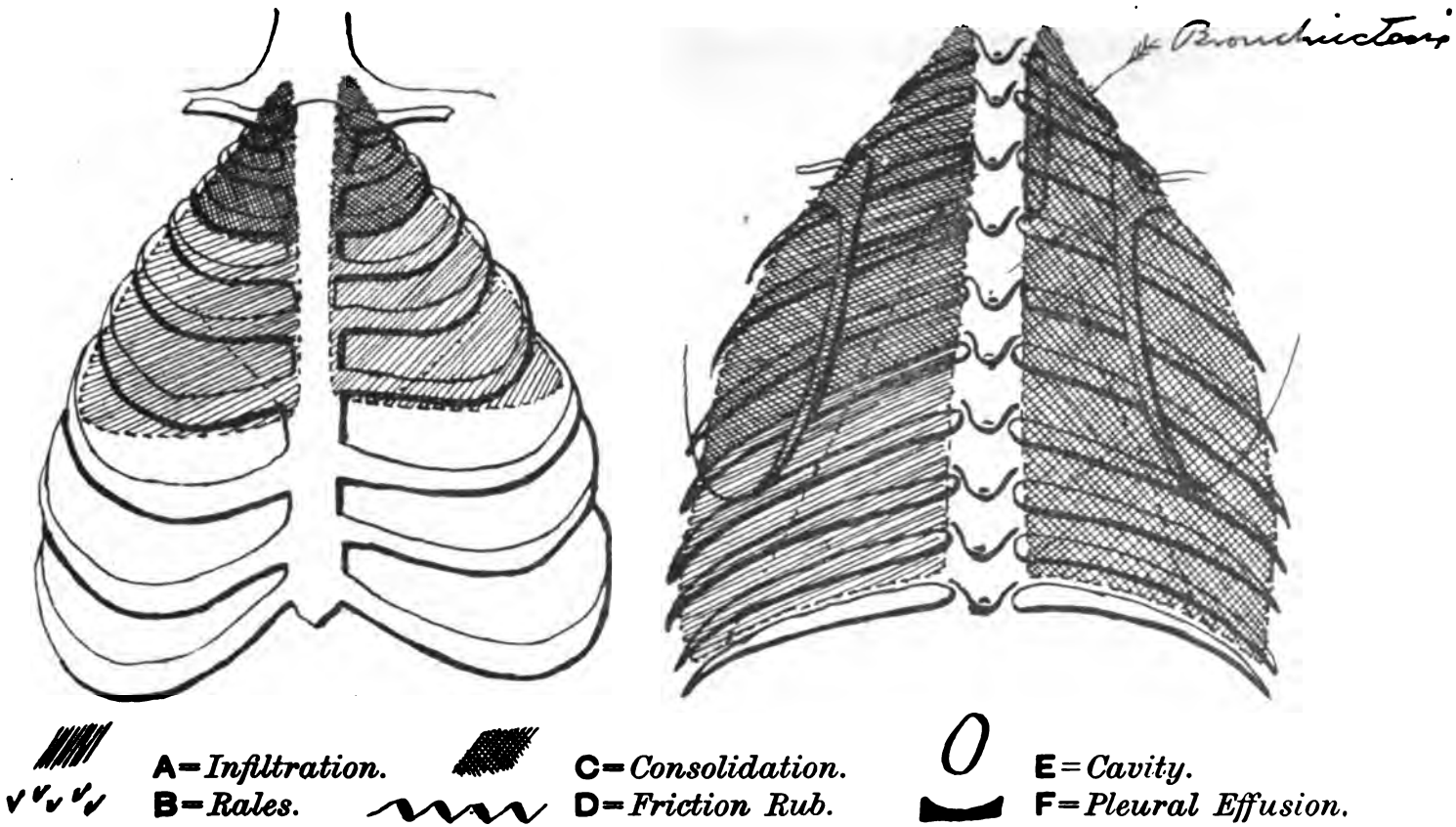

FIG. 6.—CHART SHOWING LUNG INVOLVEMENT OF CASE 2 ON DECEMBER 13, 1907.

PRESENT CONDITION.

Has improved in weight; cough is about the same; sleeps well at night, but is nervous on account of inactivity. Pulse, 96; respiration, 16; normal weight, 145 present weight, 130½; chest circumference, normal, 34; inflated, 34½; deflated, 32¾; mean, 33⅞. Body nourishment fair; muscles soft.

Inspection.—Myotatic reflex present. Medium well-shaped chest. No retraction of apices.

Right lung, anteriorly.—Slight dullness over apex, percussion over remainder of lung normal. Vocal fremitus absent, voice sounds distant at apex. Expiration prolonged, breathing bronchial in character to the third intercostal space.

Right lung, posteriorly.—Slight dullness over the left scapula, otherwise normal. Above the scapula vocal fremitus increased; also just below the scapula. Whispered pectoriloquy increased at the inferior angle of scapula. Breathing broncho-vesicular and prolonged to lower edge of scapula.

Left lung, anteriorly.—Percussion note normal. Vocal fremitus absent. Voice sounds distant at apex. Bronchial breathing extends to the third intercostal space. Râles in apex down to nipple.

Left lung, posteriorly.—Percussion note normal. Whispered pectoriloquy increased at the inferior angle of the scapula. Breathing broncho-vesicular and prolonged to lower edge of scapula.

Other organs and tissues.—Liver, spleen, abdomen, genito-urinary tract, and ischio-rectal-fossæ are normal.

Pulmonary summary.—Both lungs are involved, but there is apparently very little activity in either, and this is confined to the left lung. The apices are both involved, but no activity can be detected. The entire left lung is involved. The upper and middle lobes of the right are involved. Apparently there is some extension to his larynx.

CLINICAL NOTES TAKEN FROM THE CASE PAPER.

July 12: General condition fair, weight, 130½ pounds.

July 19: Same; weight, 129; loss, 1½ pounds.

July 26: Same; weight, 126¾; loss, 2¼ pounds. Loss might be attributed to hot weather.

August 2: General condition not so good; weight, 123¼; loss, 3½ pounds.

August 9: Hot weather very bad for this patient; weight, 122¼; loss, 1 pound.

August 16: Continued loss; weight, 121½; loss, ¾ pound.

August 23: Condition unchanged; weight, 121; loss, ½ pound.

August 30: Weight, 120; loss, 1 pound.

September 6: Weight, 118½; loss, 1½ pounds.

September 13: Weight, 117¼; loss, 1¼ pounds.

September 20: Weight, 117; loss, ¼ pound.

September 27: Weight, 116; loss, 1 pound.

October 4: Weight, 114½; loss, 1½ pounds.

October 11: The same. Patient is hoarse and he can scarcely speak above a whisper.

October 18: Granted permission to consult a specialist in Denver.

November 25: Returned much worse. A large active post-palatal ulcer on left side, which has produced marked prolapse, and partial loss of deglutition. Unable to see larynx, but epiglottis shows active ulceration, about one-half left side of epiglottis eroded. Cords must be affected because patient can not speak above a whisper.

December 10: Ulcer in throat extending from anterior pillar right tonsil to median line posteriorly, and uvula anteriorly. Left tonsil so swollen no examination made on that side. Cords not seen.

[Physical examination report, being the result of the second examination, in bed, made December 13, 1907.]

PRESENT CONDITION.

Feels weaker. Coughs more but does not expectorate as much. Appetite poor, sleeps poorly, bowels regular. Has aphonia, throat feels better since treatment commenced. Pulse, 72 to 95; temperature, 96 to 100; respiration, 16; weight, 100.5; chest circumference, 31 inches; chest inflated, 32 inches; chest deflated, 30 inches; chest expansion, 2 inches.

Inspection.—Body emaciated; chest elongated and flattened; marked retraction of both apices. Muscles soft and atrophied.

Right lung, anteriorily.—Myotatic reflex present. Because of aphonia, tactile fremitus can not be obtained. Very dull to the level of the second rib; slight dullness below this point. Very marked bronchial breathing to the second rib, below which point it is bronchial. On account of aphonia, vocal fremitus can not be obtained. Whispered pectoriloquy to the third rib.

Right lung, posteriorily.—Slight general dullness. Pronounced breathing to the level of the third dorsal vertebra, below which point it is bronchial. Whispered pectoriloquy general, and is very pronounced opposite and between the first and fourth dorsal vertebræ, extending outward about 1½ inches.

Left lung, anteriorily.—Myotatic reflex present. Percussion negative. Bronchial breathing general. Whispered pectoriloquy to the lower border of the third rib.

Left lung, posteriorily.—Slight general dullness. Bronchial breathing general. Whispered pectoriloquy to the sixth dorsal vertebræ.

Other organs and tissues.—Heart, normal; penis and appendages, normal. Because of patient's weak condition, other regions were not examined.

Pulmonary summary.—Consolidation of right lung, anteriorly, down to level of third rib, from which point to the base it is rather profoundly infiltrated. Consolidation of entire right lung, posteriorly, with possible cavity area or an area of bronchectasis between the levels of the first and fourth dorsal vertebræ. Consolidation of left lung, anteriorily, down to level of third rib, below which point the lung is rather profoundly infiltrated. Consolidation of left lung, posteriorily, down to the level of the sixth dorsal vertebræ, below which point it is profoundly infiltrated.

CLINICAL NOTES TAKEN FROM THE CASE PAPER.

December 21: Patient has been in bed two weeks. The throat condition is the same. Slight increase in weight.

December 30: The same.

January 15: Patient allowed up an hour a day; gains and loses, but general condition not as good as one month ago.

January 22: Doing about the same.

February 1: Patient some worse; throat lesions extended; treatment of $HgCl_2$ ⅛ gr. hypo. started

February 8: Not improved. Ulcer in throat more extensive; great difficulty in swallowing. Fauces nearly closed.

February 12: Uvula destroyed by ulcer; gums sore on pressure. Ulcer cauterized with chromic acid. H_2O_2 used on ulcers with other solutions.

Physical examination report, being the result of the third examination, in bed, made February 13, 1908.]

PRESENT CONDITION.

Feels better. Appetite poor; sleeps poorly; bowels regular. Coughs at meal times, when throat is aggravated; expectorates considerably. Is being treated for throat, which feels much better. Temperature, 98 to 100.5; pulse, 90 to 110; respiration, 14; weight, 104½ pounds; chest circumference, 32 inches; chest inflated, 32¾ inches; chest deflated, 30½ inches; chest expansion, 2¼ inches.

Right lung, anteriorly.—Myotatic reflex present. On account of aphonia, tactile and vocal fremitus can not be obtained. Marked dullness to the second rib, below which point there is slight dullness. Bronchial breathing, but is more marked above the second rib. A few dry râles at extreme base. Whispered pectoriloquy to second rib.

Right lung, posteriorly.—Dullness, general. Bronchial breathing general, but is more marked above the third rib. A few dry scattered râles. Whispered pectoriloquy to second rib.

Left lung, posteriorly.—Dullness, general. Bronchial breathing to level of second dorsal vertebra, below which point it is broncho-vesicular. A few dry scattered râles throughout. Whispered pectoriloquy to level of third dorsal vertebra.

Other organs and tissues.—Heart, normal; liver, normal; spleen, normal; kidneys, normal as to position; abdomen, normal.

Pulmonary summary.—Nonactive consolidation of right lung, anteriorly, down to second rib (?), below which point it is markedly infiltrated. Nonactive consolidation of right lung, posteriorly, down to level of sixth dorsal vertebra, below which point it is markedly nonactively infiltrated. Nonactive consolidation of left lung, anteriorly, down to level of second rib, below which point it is nonactively infiltrated. Nonactive consolidation of left lung, posteriorly, down to level of third dorsal vertebra, below which point it is nonactively infiltrated. Throat has improved.

CLINICAL NOTES FROM THE CASE PAPER.

February 15: Ulcer not extending. Swelling of tonsils reduced; treatment continued, hypo. and local. Injection changed to hydrargyrum succinimide gr. $\frac{1}{5}$.

February 17: Ulcer is rapidly clearing. Swallowing easier. Granulations with some blood are now present on surface of ulcer.

February 19: Injection of hydrargyrum succinimide increased to gr. $\frac{3}{10}$.

February 20: Ulcer in throat continues to do well. Swelling of pharynx reduced sufficiently to allow use of mirror. Epiglottis shows no ulcers, but is very red and thick; about one-third of its circumference shows more loss of substance from former ulcers. Mucous lining of larynx much swollen; true cords not in view at present.

February 23: Injection increased to gr. $\frac{2}{5}$.

February 27: Injection omitted. Sputum examination negative for T. B.; large numbers of streptococci present.

February 29: Examination of the throat shows pharyngeal and tonsilar ulceration healed and swelling much reduced; ulceration of the epiglottis healed with some loss of tissue. Mucous lining of the larynx still swollen and the true cords can not yet be seen.

COMMENT.

In this case the tubercular infection evidently occurred some time prior to February, 1906, but was not diagnosed until December, 1906, when the tubercle bacillus was demonstrated in the sputum. He was then transferred to the New York Hospital for treatment. The laryngeal involvement probably began in May, 1907, for it is stated in the history of the case: "He stopped smoking" at that time "because it hurt his throat."

He was transferred to this hospital, arriving on July 12, 1907. At the time of admission both lungs were rather extensively involved and the larynx was invaded. He grew steadily worse, the lesions in the throat, particularly, increasing rapidly. At this time our equipment was incomplete, and we were not properly prepared to treat throat cases; however, even had this been otherwise, we must in justice remember that up to the present time the most approved treatment of the throat in this class of cases has not been productive of much good.

About October 15 the patient requested permission to go to Denver to undergo special treatment for his throat. On October 18 leave was granted him for this purpose, and on reaching Denver he placed himself under the care of Doctor Dabney, who treated his throat until November 23. On that date he left Denver and returned to this hospital, arriving on November 25, his general condition slightly improved, but his throat lesions much worse. He was at once put to bed, and, our throat and nose clinic now being in operation, he was given special treatment in this direction. The patient was also placed on mercury bichloride, grm. 0.0065 (gr. 1/10), and potassium iodide, grm. 0.648 (gr. v), twice daily by mouth, and an immediate improvement in his general condition was noticeable (see temperature and weight curve from November 25 to January 17); but the throat condition became worse and he commenced to fail again rapidly. I am convinced that this retrogression was due to two causes: First, because the dose of mercury was too small, and, second, because the drug deranged the gastro-intestinal tract. Finally, the throat condition became so bad that the patient was unable to swallow the nourishment offered him.

At this juncture our hypodermic syringes arrived and on the 1st of February we gave him his initial injection, consisting of grm. 0.0081 (gr. 1/8) of $HgCl_2$. The injections have been continued every other day, hydrargyrum succinimide being substituted on February 15, and the dose has been gradually increased until now he is taking grm. 0.026 (gr. 2/5) every other day. Since the commencement of this treatment his general condition has slowly improved (see temperature and weight curve from February 1 to 29) and his throat lesions have rapidly improved, all ulcerations above the true cords

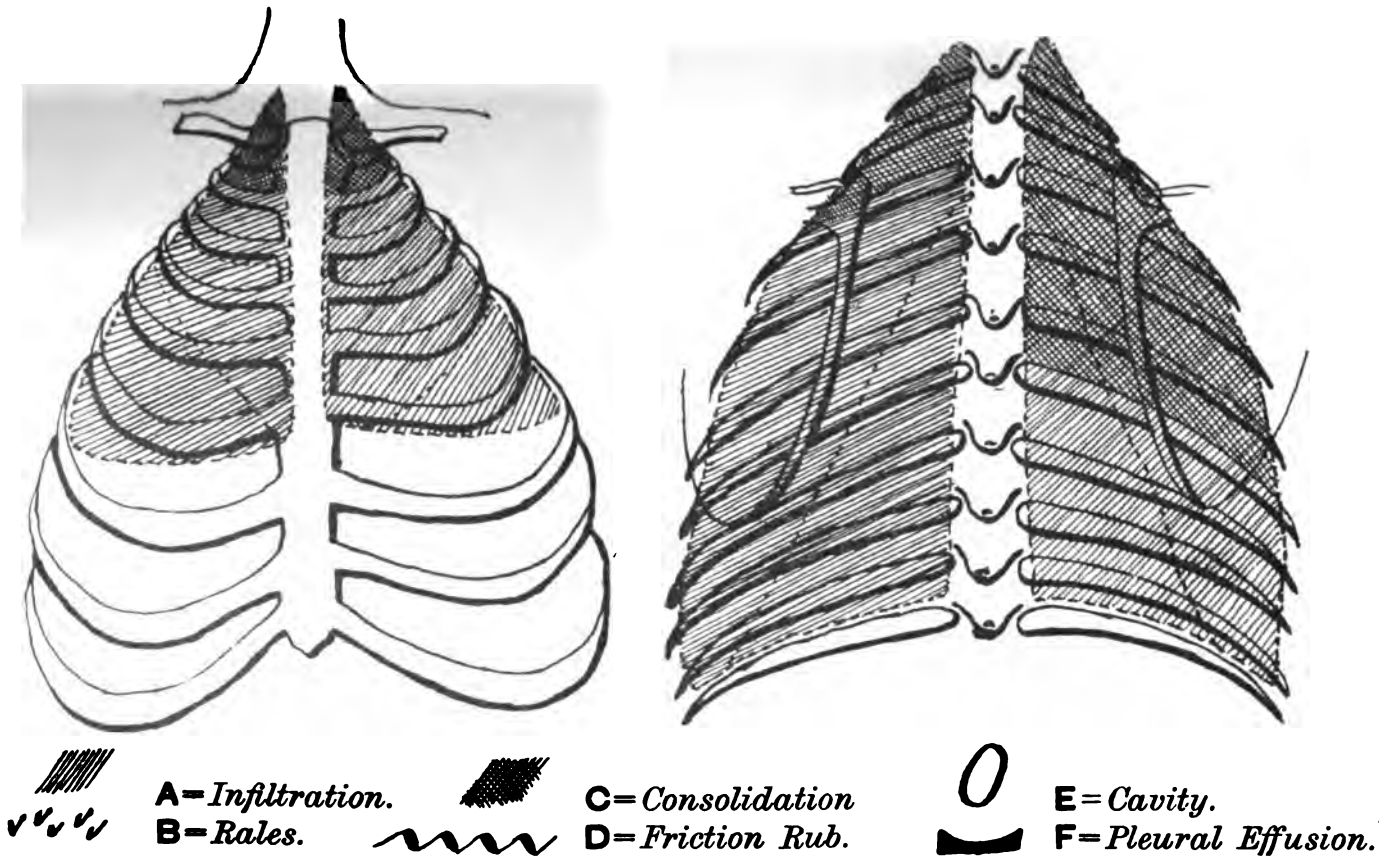

FIG. 7.—CHART SHOWING LUNG INVOLVEMENT OF CASE 2 ON FEBRUARY 13, 1908; MERCURIAL TREATMENT INSTITUTED FEBRUARY 1, 1908.

TEMPERATURE CURVE.

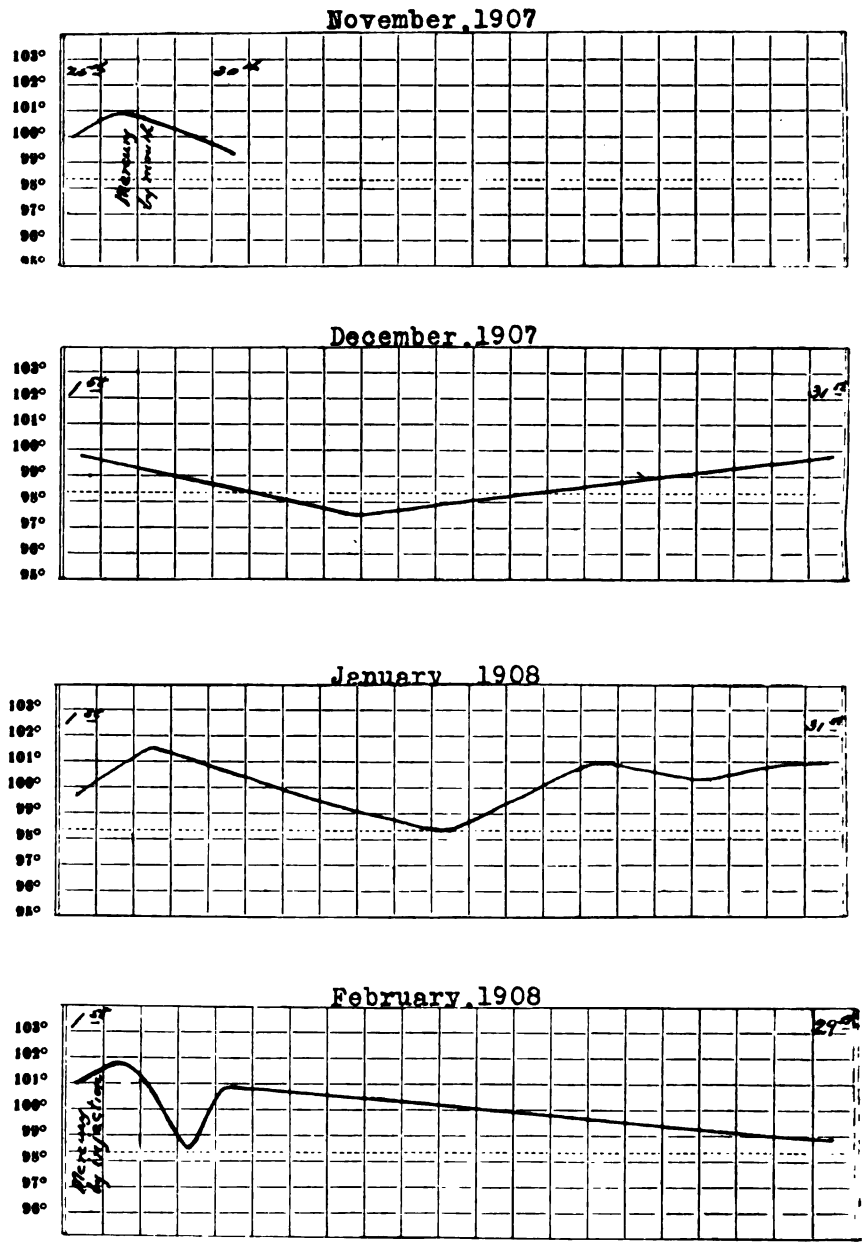

FIG. 8.—CHARTS REPRESENTING THE 5.30 P. M. TEMPERATURE RECORD OF CASE 2 FROM NOVEMBER 25, 1907, WITH PARTICULAR REFERENCE TO THE DECLINE AFTER MERCUPIAL TREATMENT WAS INSTITUTED.

being entirely healed. The swelling of the mucous lining of the larynx still prevents the cords from being seen.

Attention is invited to the comparison between the findings of the second physical examination, made on December 13, 1907, and those of the third physical examination, made February 13, 1908. It will be noticed that, although the same area is still involved, the degree of involvement was found to be much less on the latter date, a considerable area of consolidation in each lung having cleared up, remaining as areas of infiltration.

On February 27 the sputum examination was negative for the tubercle bacillus, but large numbers of streptococci were present.

The improvement in the condition of this patient is as remarkable as that of the first case, when we take into consideration his advanced age (44 years) and the long period of time during which he has suffered from the disease.

We now have 35 patients in all on this treatment, most of whom have well advanced pulmonary lesions, and, among them, one with tuberculosis of the glandular system. In this case the anterior cervical glands on both sides presented masses as large as hens' eggs, and his pulmonary condition was far advanced, the entire upper right lobe being excavated. He was placed on the injections on February 11 and, although the case is considered hopeless, his general condition has slightly improved, and the masses of enlarged glands in the neck are reduced to at least one-half their original size.

Out of the 35 cases under treatment, 30 are showing improvement, as evidenced by reduced pulse rate and temperature curve, increased appetite, lessened cough, and a gain in weight. The remaining 5 are holding their own.

With the exception of the 2 cases fully reported in this paper, the time of treatment has been so short that a detailed report of the remaining 33 cases will be reserved for a later period.

CONCLUSION.

I desire to invite special attention to the following observed results of this treatment, viz:

First. We have shown the almost immediate improvement in the general condition of the patient, following the administration of mercury; the slowing of the pulse, the reduction of temperature, and the gain in weight.

Second. We have conclusively demonstrated that it will cure extremely advanced tubercular ulceration of the larynx and pharynx in a remarkably short period of time.

Third. We have shown that it produces marked improvement in advanced pulmonary lesions, and that it also has a decided beneficial action on tubercular glands.

We have most carefully questioned the patients, representing cases Nos. 1 and 2, and can not obtain the slightest history of syphilitic infection; nor have we been able, with the application of the most exhaustive diagnostic methods, to find traces of this disease. We therefore believe these cases to be unmixed tubercular disease.

I desire, also, to lay stress upon the fact that large and increasing doses of mercury are required, and we have found that tubercular patients are extremely tolerant of the drug. They not only require but, fortunately, tolerate larger doses than syphilitics. In this connection, however, it is to be said that patients with slight infection, small pulmonary lesions, and extremely moderate constitutional symptoms, do not stand large doses as well as the advanced cases. Several of these developed sore gums following an injection of grm. 0.026 (gr. $\frac{2}{5}$) of the succinimide, and the dose has had to be reduced.

A CASE OF FRACTURE OF THE ATLAS AND AXIS, WITH FORWARD DISLOCATION OF THE OCCIPUT ON THE SPINAL COLUMN; LIFE MAINTAINED FOR THIRTY-FOUR HOURS AND FORTY MINUTES BY ARTIFICIAL RESPIRATION, DURING WHICH TIME A LAMINECTOMY WAS PERFORMED UPON THE THIRD CERVICAL VERTEBRA; REVIEW OF LITERATURE.

By Surg. N. J. Blackwood, U. S. Navy.

At 1.05 p. m., September 18, 1907, the patient, G. F. G., ordinary seaman, U. S. Navy, aged 19 years and 3 months, was doing some gymnastic exercises on the gun deck of the U. S. S. *New Jersey*, and while attempting the trick known as "cutting off" his hands slipped and he fell to the deck, a distance of about 4 feet, landing on the right side of his head, the weight of his body being above and his head and neck bent underneath. He was immediately picked up by his companions and carried down to the sick bay, as he was unable to walk and apparently unconscious. He was at once seen by the medical officer on duty, who finding him cyanotic and gasping for breath immediately started artificial respiration. Upon examination the following condition was discovered:

Complete paralysis, both motor and sensory, from the line of the larynx down. Muscles were flaccid, with no rigidity anywhere and no constrained position assumed by any of the extremities. All reflexes were lost and remained so while life lasted, with the single exception of the plantar reflex, which returned very slightly about five hours after the accident. Priapism was present within the first half-hour and remained constant until death supervened. There was an involuntary evacuation of the bowels within the first fifteen minutes, but no passage of urine, which had to be withdrawn with a catheter. The patient was perfectly conscious during the whole period of life, hearing and understanding everything that was said

WEIGHT CURVE (CASE 2).

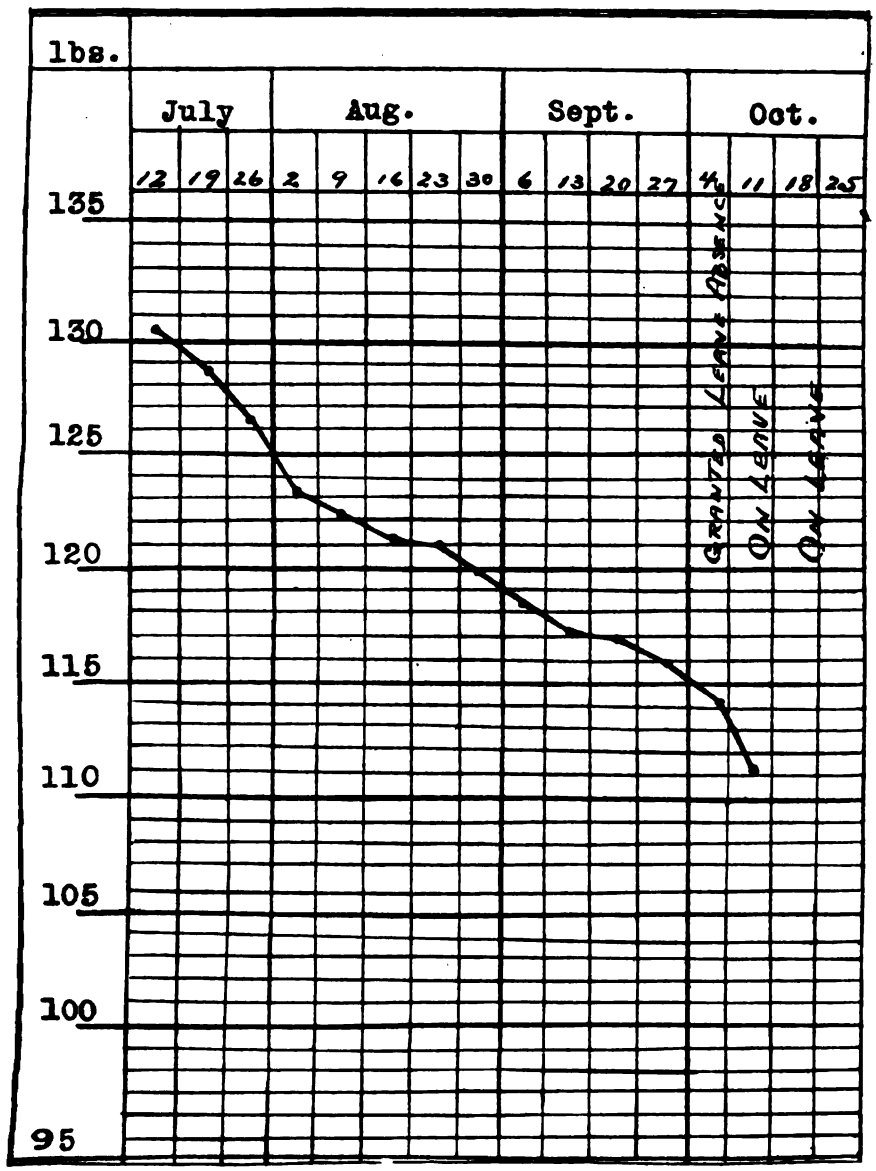

FIG. 9.—CHART SHOWING VARIATION IN WEIGHT OF CASE 2.

WEIGHT CURVE (CASE 2, CONTINUED.)

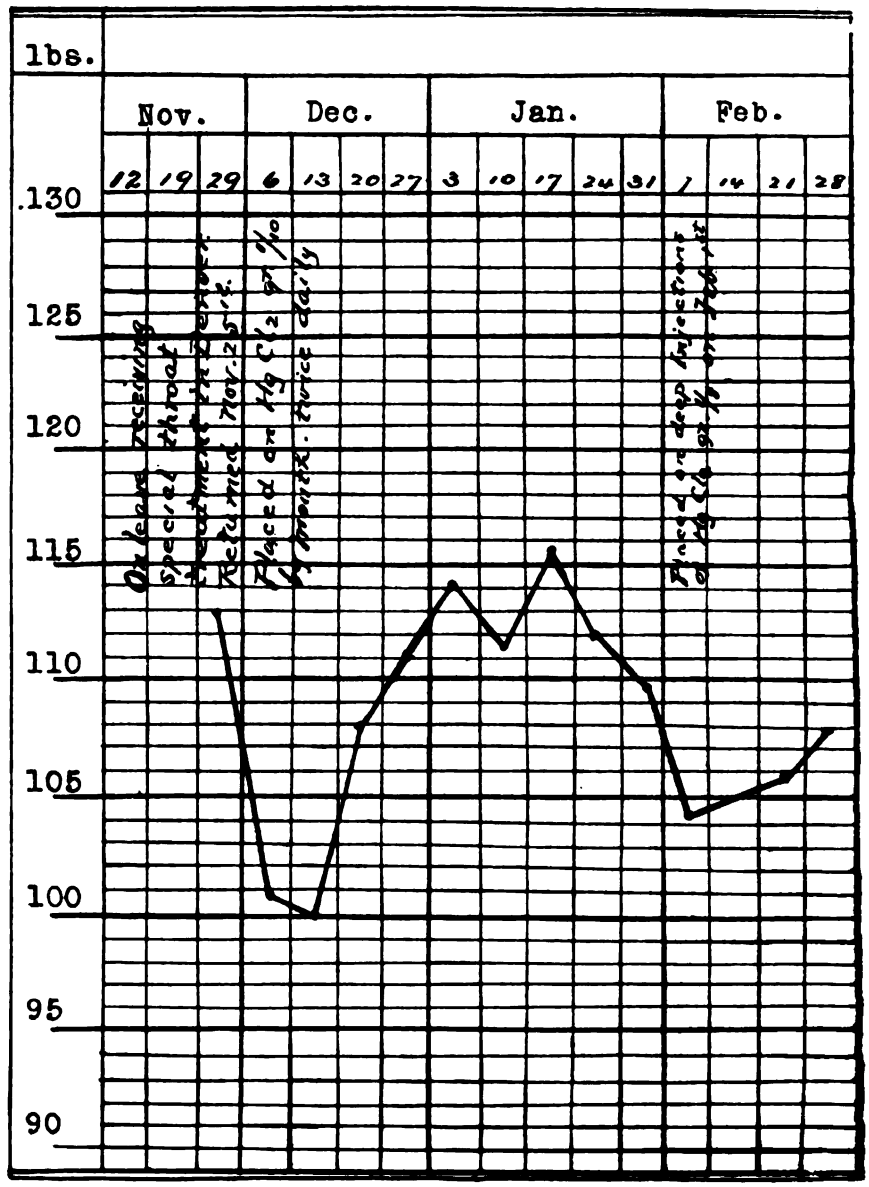

FIG. 10.—CHART SHOWING VARIATION IN WEIGHT OF CASE 2, WITH PARTICULAR REFERENCE TO IMPROVEMENT AFTER MERCURIAL TREATMENT WAS INSTITUTED.

to him and replying, either by winking the eyes, by nodding and shaking the head, or, when air was being forced through the larynx, by a few spoken words. At all times he could move his lips and tongue to form words; but no articulate sound could be made, except when aided by very forcible pressure on the chest walls. The paralysis of respiration was complete and, as far as could be discovered, there was no organ below the larynx that was performing its normal function, with the single exception of the heart. Attempts to breath were accompanied by frequent tracheal tugs, and the tongue would be protruded. The face became screwed up whenever the patient tried to swallow. There was no sense of thirst or hunger and, after a little water had been given the patient by means of a medicine dropper, he refused to take anything which had to be swallowed. Contrary to expectation and the usual result of mouth breathing, there was never any dryness of the tongue and fauces. When first seen and when the patient's efforts to breath were most pronounced, there appeared to be a narrowing of the fauces, caused by a protrusion of the posterior wall. The eyes were at first closed and, on separating the lids, external strabismus and pin-point pupils were found to exist. Both of these conditions improved until the eyes became almost normal, responding to light, etc., and in all respects symmetrical.

At first the heart was almost inaudible and very slow and the patient pulseless; but, under the influence of artificial respiration and cardiac stimulants, the impulse became full and strong and the beats quickened to 72, though they were irregular and intermittent, sometimes dropping two or three and at other times giving an abortive beat.

The patient at no time seemed to suffer from pain, but on being questioned said: "My head hurts." The body surface temperature was normal at first, but later fell and had to be maintained by the application of hot-water bottles. There was no area of hyperæsthesia or of marked sweating in any locality until, on the second day, the body was so bathed in sweat that it was thought there had been an evacuation of urine. A careful examination of the spinal column in the cervical region revealed no dislocation, as far as the spinous processes were concerned; but there seemed to be an unusual depression between the atlas and the base of the occiput. Believing that this might evidence a dislocation, an attempt was made to effect a reduction by extension and counter extension, with manipulation of the cervical vertebræ, but no permanent change or improvement in the general condition resulted.

As all the symptoms pointed to an injury at or above the third cervical vertebra; as nothing so far had effected any relief of the symptoms, and as the patient was only being kept alive by means

of artificial respiration, which could not be continued indefinitely, it was decided, in the hope that there was not a complete transverse lesion of the cord, to do a laminectomy on the third cervical vertebra, and relieve any pressure which might exist either as the result of hemorrhage, fracture, dislocation, or penetrating bone spicule. How to perform a laminectomy on a patient who must be on his back in order to be given respiratory aid was the question which then arose. It was suggested that he might be put on his side and unilateral respiratory movements be made, or on his face and pressure exerted on his back. The former method was first given a trial and artificial respiration practiced with one arm, which supplied a certain amount of air; but the patient's color soon showed that he was not getting sufficient, and he was then turned on his face for a trial of the latter method, the forehead and chin being supported by hard pillows. To our surprise we heard him gasp, and all artificial movements being stopped, *the patient performed the respiratory act unaided, by the operation of the diaphragm alone.* In this position and in this way the patient continued to breathe for seven minutes, when cyanosis developed, gradually deepened, and he ceased breathing. He was immediately put on his back and artificial respiration recommenced.

It was now realized that the operation must be done with the patient on his back, if it was to be done at all. The usual steps in the preparation of a patient for operation were taken, but in addition an aseptic towel was wrapped about the head in a manner to act as a sling. The patient was placed on the table with the head and neck extending beyond the end and supported by the sling in the hands of a nurse. One nurse was on each side of the table, each having an arm and doing the usual motions for artificial respiration. The operator on a low stool had to work much as a fresco painter when decorating a ceiling. It was found that by slightly elevating the head the field of operation was better exposed: but this bending of the neck also cut off the free passage of air to the lungs, so that every few minutes the head had to be lowered to the horizontal position and artificial respiration practiced more vigorously. With these frequent interruptions the operation required much more time than it would ordinarily have, as can be well imagined. Of course inhalation anæsthesia could not be employed, but as all sensation was lost from the middle of the neck down a local anæsthetic (cocaine) only was necessary to destroy sensation in the small part of the field of operation still supplied with active nerves. The patient was perfectly conscious during the whole operation and felt absolutely no pain. The operation was begun about 11.30 p. m. and completed at 1.50 a. m. It is not necessary to describe the various steps in technique, as they are well known to all. The spinous processes and

laminæ being exposed, no fracture could be felt; but there seemed to be increased lateral motion of the atlas, and a dislocation of the occiput forward on the spinal column was very evident. All attempts for its permanent reduction, however, failed. The spinous process and laminæ of the third cervical vertebra were removed and the membranes of the cord exposed. Aside from the fact that there was a slight congestion, these appeared to be perfectly normal and were not disturbed. The patient stood the operation very well and, except for a little extra stimulation on account of the heart action, he required no special treatment, and showed no ill after effects. Nor were any good results noticed. His condition continued the same until about 10 a. m. of the 19th, when he vomited a bile-stained fluid. Eight hundred c. c. of urine were drawn off, and at 11 a. m. he vomited again. About noon some blood-stained moisture appeared on the sheet under the patient, and it was feared there might be some recurrent hæmorrhage from the wound. This was examined and found in perfect condition—clean, dry, and healthy, and it was then discovered that the moisture on the sheet was caused by most profuse sweating of the patient's body.

During the afternoon the patient had several sinking attacks, during which he became pulseless and from which he could only be revived by heroic efforts. He remained conscious up to the last, except during these syncopal attacks; but the heart grew gradually weaker, responding less and less to stimulation, and he finally died at 11.45 p. m., September 19.

A post-mortem was held at 10 a. m. September 20, ten and a quarter hours after death, and the following condition found: The occiput was dislocated forward on the spinal column, and the cord nipped between the posterior edge of the foramen magnum and the posterior surface of the odontoid process of the axis. The atlas was fractured in three places, twice laterally just at the point of attachment of the transverse or check ligament and once posteriorly; the odontoid process was broken off short on a line with the superior articular surface of the axis; the membranes of the cord were intact, but the cord itself was reduced to a pulpy mass from the level of the foramen magnum to the interval between the axis and the third cervical vertebra. From the disclosures at the post-mortem we are convinced that nothing could have been done to save the patient's life, and the wonder is that he should have lived so long. Had it not been for the prompt action of Asst. Surg. M. H. Ames, U. S. Navy, in starting artificial respiration and the untiring efforts of the corps of nurses and assistants in administering the same this would have been one of the cases of practically instantaneous death that are so common with a broken neck. We regret sincerely that we are unable to show the specimens taken most carefully from this

case, but, through the carelessness of one of the post-mortem room attendants, they were burned.

Medical literature is full of reports of cases of fracture dislocations of the vertebræ and discussions of the symptoms, treatment, and prognosis of spinal injuries; but in a most careful search we have been able to find but one reported case similar to our own as to location and character of fracture, in which artificial respiration was carried on for three and one-half hours, and no case, under similar conditions, in which an operation was performed or life prolonged for so many hours. We are therefore led to believe that the case is unique, and report it as such. There are many points which it would have been most interesting to study, but the conditions and the serious chances attending any precise investigation of interfering with the artificial respiration rendered it practically impossible to pursue our observations.

Turning to the literature on the subject of injuries to the spinal cord, we find in Keen's Surgery, page 864, volume 2, the following:

> Transverse lesions of or above the fourth segment are at once fatal from asphyxia, from paralysis of the phrenic. In transverse lesions of the cord there is immediate flaccid motor paralysis of the parts below the level of the lesion, without rigidity or spasm of the muscles. In complete transverse lesions the area of anæsthesia involves all forms of cutaneous sensibility. In injuries above this point (2, 3, and 4 lumbar segments) they (the knee jerks) are usually lost at once and permanently in complete crushing lesions.

All of these observations are well exemplified in our case. In his Treatise on Surgery, speaking on the subject of fractures of the vertebræ, Fowler says:

> In cases of fracture of the odontoid process the head is held rigidly fixed, and when accompanied by displacement the larynx is unduly prominent.

In our case there was no rigidity of the head, nor was the larynx prominent; but there was a prominence in the fauces due to the dislocation forward of the occiput, and probably the complete paralysis of all the muscles below the level of the cord lesion prevented any rigidity.

In Nervous Diseases, by M. Allen Starr, 1907, there appears the following most interesting and complete description of injuries similar to the one we have just reported, and, in view of the many points which were exemplified in that case, it seems well worth repeating here, in part:

> Such an injury is usually attended by a compression and bruising or a laceration of the cord; a disintegration of its substance; and a considerable hemorrhage that perforates the cord and is followed by an inflammatory process that may intensify the disintegration. * * * When the cord is exposed at the autopsy, or in a surgical operation for the repair of a fracture, its external appearance may not be changed, and if the pia and sheath be not ruptured there may be very little evidence of the extreme destruction present. It is only upon section that the lesion is evident.

This was exactly the condition that we found on operation. The membranes were intact and there was no evidence of crushing and but little of any bruising, but at the autopsy the cord was found pulpy, disintegrated, and practically destroyed. In this connection Walton[1] shows an excellent picture of a spinal cord crush at the level of the sixth cervical vertebra:

The principal interest lay in the beautiful manner in which it illustrated complete disintegration at the level of the crush with an external appearance of normal cord. This is perhaps the most frequent finding on operation. In this case the operation (by Dr. E. A. Codman) showed an apparently healthy cord, although the paralysis, sensory, and motor was complete. It was assumed, however, from the symptoms, that the cord had been crushed. Death followed within a few days, and the autopsy showed that, while the surface of the cord was not ruptured at the spot of injury, a split had occurred at a somewhat lower level, with extensive hemorrhage. There was entire loss of reflexes, as is usual in complete transverse lesion at any level of the cord, contrary to the earlier teaching.

Continuing the quotation from Starr:

The level of the symptoms indicates the level of the lesion. Fractures of the upper four cervical vertebræ are usually attended by sudden death, either from involvement of the vital centers in the adjacent medulla or by a lesion of the centers of the phrenic nerves and respiratory paralysis. In the few patients who have survived for a few days pain has been felt in the occipital nerves, the head has been held rigid, and any motion of it has been very painful. * * * A total paralysis of the entire body below the neck has occurred. * * * Death always follows soon.

Diagnosis.—If any sensations whatever are felt by the patient in the parts below the lesion, such as pain, cramps, numbness, distension of the bladder or rectum, and abdominal pain, or if changes of position of the limbs are perceived, or if any motion in the legs is possible, the lesion is not complete. Even when there is total anæsthesia it is possible in some cases to cause sensations by severe irritation by needles in the paralyzed parts, and these are felt in the hyperæsthetic zone. This never occurs if the lesion is total. The tendon reflexes return soon, if lost at first, and become exaggerated in partial lesions. If the lesion is total, the patellar tendon reflex is permanently lost (Miles, Bastian, Kocher); the paralysis of the legs is flaccid, and they show no rigidity on passive motion; the line of anæsthesia is more sharply defined and is absolute; skin reflexes are lost; there is greater vaso-motor paralysis in the parts below the lesion; the limbs are hot, the veins distended, priapism is present or easily produced by irritation of the genitals, groins, or thighs, the urine is retained and the rectum paralyzed.

Prognosis.—Inasmuch as a repair of the spinal cord does not occur, and although scar tissue may form at the seat of the lesion, no restoration of continuity of the nerve fibers is possible, and no regeneration of nerve tissue within the cord has ever been known to occur; the prognosis in spinal injuries is a very bad one.

In partial contradiction to some of these statements under *Prognosis* may be cited the well-known Stewart-Harte[2] case, in which a complete transverse lesion of the spinal cord was repaired after having been produced by a gunshot injury. It may be well to quote the following from that report:

Stroebe (Ziegler's Beiträge, 1894, vol. xv), as the result of experiments on rabbits, found that the axis cylinders of the dorsal roots that were crushed at the level of the cord injury made an attempt to pierce the cicatricial tissue in the cord.

There are numerous cases of partial severance of the spinal cord, with either complete or partial recovery of motion and sensation in the paralyzed parts. Also, cases of recovery from compression and caries, though these may not be examples of regeneration but "a split-off portion of the pyramidal tract." Schiff explains this by "functional reparation" of the lesion, one portion doing the work of the other. The results concerning the return of function were unsatisfactory. The axiom of spinal surgery is—

That compression, and compression only, without injury to the cord, can be benefited by operation, but sufficient compression to produce anæsthesia or paralysis must be accompanied by the cutting, crushing, or tearing of thousands of axis cylinders, and, if axis cylinders once injured never recover, the removal of pressure or of a spicule of bone sticking into the cord can do no good, and all operations are contraindicated except to control hemorrhage and combat sepsis.

In "A summary of all the cases of fracture of the spine (244) which were treated at the Boston City Hospital from 1864 to 1905," Burrell[3] gives a very interesting table of proportion of symptoms, of which the following is an extract:

Crepitus, 37.8 per cent; deformity, 68.1 per cent; unconsciousness, 17.6 per cent; paralysis, complete, 71.7 per cent; paralysis, partial, 11.3 per cent; paralysis, none, 11.1 per cent; pain, 74.8 per cent; priapism, 66 per cent; delirium, 14.7 per cent; 86 cases in cervical region, with 77 deaths; total mortality, 64.5 per cent; within 5 days, 117.

He then goes on to say that a total transverse destruction of the cord may be deduced from the persistence of the following symptoms: "The total loss of all reflexes, complete insensibility to touch or pain, and a motor paralysis below the level of the lesion."

Thomas[4] states that—

The factors in drawing the conclusion that there is a complete transverse lesion of the cord are: (1) Complete paralysis, usually of a flaccid type; (2) a complete loss of sensation in all its forms; (3) absent reflexes, especially the knee jerk, while the plantar reflex, on the contrary, is often retained; (4) complete paralysis of the bladder and rectum with priapism; (5) vaso-motor paralysis, with severe sweating in the paralyzed parts; (6) and most important, absence of variation in the symptoms; (7) absence of irritative phenomena, such as pain.

Walton states:

There are no symptoms which establish (otherwise than through their persistence) irremediable crush of the cord. * * * While total relaxed paralysis, anæsthesia of abrupt demarcation, total loss of reflexes, retention, priapism, and tympanites, if persistent, point to complete and incurable transverse lesion, the onset of such symptoms does not preclude a certain degree at least of restoration of function.

He also states that we have no infallible guide to the extent of the lesion.

Morton[5] says:

We have not any means of deciding whether the cord has been crushed at the moment of the accident or whether it is subject to persistent compression by displaced bone or by bone clot. * * * The most serious damage to the cord usually takes

place at the actual moment when the displacement occurs. * * * The persistent displacement may exercise some compression on the cord, but this is not the rule. * * * In 21 cases which Bowlby[6] examined post-mortem, although death was due to injury to the cord, in no case was that injury the result of persistent compression, but in every instance it was due to the severe crushing which the cord had sustained at the moment when the displacement occurred. * * * If the fracture-dislocation occurs above the level of the fourth cervical vertebra, the phrenic nerves will be paralyzed, the diaphragm will cease to act, and death will probably at once occur. * * * Injuries to the lower cervical and upper dorsal region of the cord may also cause contraction of the pupil on one or both sides from paralysis of the sympathetic dilating fibers. * * * In a crush of the cord above the fourth cervical vertebra death is nearly always instantaneous. That the patient may survive some hours is shown by two recorded cases. * * * If the knee jerks are lost we probably have a complete transverse crush of the cord, and this can not be repaired. Persistent compression is rare, and it is unlikely the symptoms would be relieved by its removal, for the great probability would be that the cord had been hopelessly crushed before it was persistently compressed.

He does not recommend manipulation.

Bryan[7] says:

The eight cervical nerves come from points within the cord between the first and sixth cervical vertebræ. The point I wish to make clear is that the function of the cord, although it is not always completely destroyed, may yet be so destroyed that it is impossible to determine whether we have a complete lesion, a partial lesion, or simple pressure of a marked degree on the cord. If the paralysis is not complete, sensation is more easily elicited than motion. If the function of the cord is completely suspended, especially in cases in which crushing has taken place, all reflexes in the paraplegic area are obliterated. Priapism is likely to occur, especially in fractures of the cervical region. Fractures in the lower cervical and upper dorsal regions produce mydriasis because the pupil center lies in this part of the cord. In the lower cervical region breathing is disturbed, and complete crushing of the cord or suspension of its function at the level of the third cervical vertebra means suspended respiration, and therefore the death of the patient. * * * It needs to be impressed again that we are unable from evidence derived from an examination of the region injured, or from that produced from the symptoms following the paralysis, to determine the all-important point as to wheteher the cord has been completely lacerated or not.

The question as to whether or not an operation should be performed in these cases and, if so, when, has been the subject of much discussion by many of the leading surgeons of the world, and the decision remains very much with the surgeon himself and the conditions of his particular case. He will find plenty of authority in his favor whichever way he decides. Speaking on this point, Doctor Bryan continues:

It is the surgeon's duty, if there is the remotest doubt, to cut down on that spinal cord purely for diagnostic purposes. Then, if he finds a condition that is capable of relief, he has done his duty and can do it. If he finds a condition that is incapable of relief, he has done the patient no harm, for the wound will heal kindly, if the ordinary teachings of surgical technique have been followed.

Mr. Thorburn [8] says:

In compound fractures, operate. In fractures of the spinous processes and laminæ, with injury to the cord, we always operate. In simple fractures and dislocations of the bodies of the vertebræ, if there is a reasonable probability that the injury is due to hemorrhage, operation is advisable; but in all other cases of this nature we can not hope to do good, save when the injury is below the level of the first lumbar vertebra. In such cases laminectomy is an eminently valuable surgical procedure.

Munro, of Boston, says:

In watching quite a considerable number of injuries at this level (cervical fractures) in the last few years not subjected to operation I have been impressed with the fact that they die a day or so earlier and that they suffer no less than similar patients who have had a laminectomy.

Thorburn, [8] again quoted in speaking of seven cases of operation, states:

In none of the cases did any real benefit result; all those in which the injury was in the cervical region died; all those in which it was below the cervical region lived, but did not recover from paralysis.

The question as to delayed or immediate operation did not play a very vital part, as operation was undertaken as the only possible hope of restoring diaphragmatic action and was done as soon as it was sure that no improvement was likely without it, and as soon as the patient could be prepared. In his conclusions he expresses his belief—

That in many cases of fracture of the spine it is impossible to primarily state whether the cord is crushed or pressed upon by blood, bone, or exudate, except by an open operation; that only by the persistence of total loss of reflexes, complete insensibility to touch and pain, and motor paralysis below the level of the lesion can total transverse destruction of the cord be diagnosticated; that if the cord is crushed, no matter what treatment is adopted, there will of necessity be a high rate of mortality.

Bowlby [9] reports a series of eleven cases of fracture-dislocations of the vertebra, in nearly all of which he notes that—

At the post-mortem the cord was found crushed and pulpy, though often the membranes were intact, and there was no compression of the cord by either the dislocated vertebra nor by fragments of the fractured bones. These cases were specially noted to show the absence of all the deep reflexes in cases of complete transverse lesions of the spinal cord. In three other reported cases of partial transverse lesions the deep reflexes were exaggerated.

In an article on fractures of the spinal cord by Estes,[10] which appeared in a recent journal, we find the following in the discussion of the advisability of operation:

If nothing is done, the fatal result may be delayed for some time, but it is inevitable and loss of function will continue until the patient dies. An exploratory operation, if it be properly done, adds very little indeed to the dangers of the condition, and it may result in restoring partial usefulness to the limbs. I am therefore convinced that the best thing to do in the majority of cases of spinal fracture with dislocation and pressure symptoms is to operate *as soon as possible.*

He then reports three cases of myelorectomy, two complete and one partial, with improvement in the first complete case and excellent results in the case of partial section.

To sum up, the death rate from spinal fractures is about 50 per cent. Early operation offers the only chance for life in cases of complete transverse lesion high up in the cord; it may not only preserve life, but also in a few cases restore some degree of usefulness to paralyzed parts where the lesion is from the mid dorsal region downward.

Dr. Robert Abbe [11] says that he has operated on perhaps 18 cases of crushed cord from fracture-dislocation, and only one was benefited.

There are cases of improvement on record, but it is difficult to say to what extent the operation contributed to the success. But though there is some difference of opinion as to the advisability of operating in injury of the cord from bending of the spine, yet it is well recognized that laminectomy is the proper treatment of fracture of the arch alone, without displacement of the body causing symptoms of injury to the cord.

Oliver [12] gives the records of the Cincinnati Hospital in a paper on "Injuries of the spine and their treatment." It includes 69 cases of fracture and dislocation. In 61 there were cord symptoms; 48 died. In 27 there were spinal symptoms; 26 died. Six were operated upon and all died; 20 not operated and 20 died; and one left hospital the next day and was lost sight of.

An analysis of the question proves that destruction of the spinal cord over a definite area, brought about by a sudden violent compression of the soft tissues of the cord between one vertebra which remains stationary and another which is displaced, leads to a pulpification of the cord corresponding in width to the pinched portion. * * * Operation may fail to reveal any bony compression present, yet a necropsy will show destruction of the cord over a greater or less area. Statistics derived from surgical operations, as well as those made post-mortem, show that in the majority of these cases an irreparable injury has been inflicted upon the spinal cord, and that restoration of function is impossible either with or without operation, unless, as suggested by the Stewart-Harte case, continuity of the cord can be reproduced.

In the opinion of Dr. Samuel Lloyd [13]—

We should wait until the period of shock has passed, or until it is evident that there will be no spontaneous recovery complete enough to render life bearable. If after this period has passed the patient still continues to improve, no operative interference should be considered; but so soon as the symptoms begin to show retrograde phenomena, or seem to have reached the end of improvement, operation should be undertaken.

In a contribution to the study of spinal fractures with special reference to the question of operative interference we find the following by Walton: [14]

* * * It is understood at the outset, therefore, that though we may follow the classification of Kocher, Bastian, Thorburn, and others, the terms complete and incomplete lesions should not imply that the symptoms of the former are necessarily incapable of amelioration. This distinction has an important bearing on the question of operation, for Kocher states that operation is out of the question in case of total transverse lesion, though in case of partial lesion we may operate later, when

long-continued pressure is shown. In discussing the question of operative interference I shall claim no originality in venturing to dissent from these views on the ground (1) that we have no symptoms from which we can assert at the outset that the cord is crushed beyond at least a certain degree of repair, and (2) that we can not predict which cases will fall into this second category, and that early operation in all doubtful cases will not only accomplish all that later operations will do for these cases, but it will be performed to better advantage before reparative processes with adhesion and callus have appeared. It should not be forgotten that in case the roots are crushed at the same level as the cord the anæsthesia will reach to the level of the lesion.

In writing of the reflexes in spinal injuries, Thorburn [15] says:

In all of Mr. Bowlby's cases, as well as in one of my own, the plantar reflex was the only one retained, and this exception is also mentioned by Bastian, who says, "When the soles of the feet are strongly tickled there may be very slight movements of the toes," and who regards the phenomenon not as a reflex, but as an idio-muscular contraction. * * * Shock is not the cause of early loss of reflexes in spinal injuries, as such shock is practically just as great in cases in which these are retained as in those in which they are lost. Where the lesion causes complete paralysis and anæsthesia, the deep reflexes are always lost. The plantar reflex * * * is obtained in many cases of complete and partial lesions.

In searching the literature for cases of dislocation of the occiput on the spinal column we find but few references to this peculiar injury. Stimson, 1900, under "Dislocations of the occiput," (from the atlas), contains the following:

The dislocation was formerly deemed quite a common one, and to this opinion succeeded another more in harmony with the anatomical conditions of the joint, but still erroneous, namely, that it had never occurred. There are, however, three observations which positively demonstrate the occurrence of the injury, those of Cortes, Bonisson, and Milner.

Again, the literature of this very interesting subject furnished many reports of cases of general spinal injuries, but comparatively few which involved only the cervical vertebræ. Some of these latter seem appropriate to repeat in this paper as showing a similarity in symptoms and results or as pointing to possibilities which did not occur to us at the time of our case.

Curling [16] reports a case of fracture of the first, second, and third cervical, the patient living twenty-eight hours:

There was total loss of sensation and motion in trunk and lower limbs; respiration by diaphragm alone; unimpaired mentality; and the patient died from dyspnœa. There was a fracture through the ring of the atlas, separating it into halves; a fracture of the axis passing transversely across its articulating processes and detaching the whole of the arch from the body of the bone; and a fracture traversing the transverse processes of the third vertebra. * * * The body of the third vertebra was a little forward, enough to project slightly beyond the fourth, but not so far as to produce pressure on the medulla. Opposite the third vertebra the cord was in a state of pulpy softening. * * * The injury was evidently above the origin of the phrenic nerve. That death, therefore, was not instantaneous can only be ascribed to the situation of the pressure, which in this uncommon instance was made on the posterior, not the anterior, part of the cord. So soon, however, as the disorganization which rapidly follows these severe injuries had commenced the phrenic nerves became involved, and the imperfect respiratory movements, performed by the diaphragm alone, being thus arrested,

death at once ensued. Case V.—Fracture of the atlas in three places; death in twenty-four hours. Case VI.—Fracture of the odontoid process. False joint.

Man [17] reports a case of fracture of the first cervical vertebra with instant death. As revealed at post-mortem:

Posterior arch was broken off and, though held in position by ligaments, could be moved by the finger; fracture symmetrical on both sides, and was just anterior to the grooves for the vertebral arteries. No displacement and no indentation of spinal cord.

Ray [18] reports complete bilateral dislocation of fifth cervical vertebra forward, with complete paralysis of limbs and bladder. Reduction very easy without anæsthesia and practically complete recovery.

Welford [19] reports fracture-dislocation of the fourth cervical vertebra forward on the fifth. Laminectomy forty-eight hours after injury and reduction easily effected, but would not remain. Vertebra wired together. Symptoms improved, but patient died in fifty-two hours with meningeal and pneumonic symptoms. Temperature, 108.

Burr [20] reports fracture of fifth cervical vertebra, lamina, and spine, with dislocation and possibly fracture of the body; recovery. No anæsthesia and but partial loss of motion; reflexes were lost at first, but soon returned.

Barnett [21] reported case of anterior bilateral dislocation of the sixth cervical vertebra, with reduction and recovery, in a boy of 10. Paralysis of both extremities. In the Stewart-Harte case, a gunshot wound completely severing the cord, the operation was performed three hours after the injury, and regeneration occurred.

Wilson [22] reports a case of fracture of odontoid process, with forward dislocation of the atlas. This case developed no symptoms until two weeks after the injury.

Sherman [23] reports two cases of successful reduction of dislocations of the neck. He says:

If the dislocaton is above the third cervical vertebra, there may be sudden death from cutting off the phrenic nerve. Below the third cervical vertebra the injury may be sufficient to cause more or less paralysis, according to the amount of damage to the cord or to the spinal nerves. Both these cases were caused by muscular action and there was no injury to the cord.

F. X. Dercum showed specimens before the Philadelphia Neurological Society from a case of fracture of the fifth cervical vertebra, causing total transverse lesion of the cord.

X-ray examination showed fracture of the fifth, sixth, and seventh cervical vertebræ; no crepitus; sensation in the upper extremities lost up to the junction of the middle and upper third of arm. Arms state of contracture; unable to raise legs; reflexes abolished; no plantar reflex; sensation in each extremity lost; semipriapism; sensation lost over entire body anteriorly to shoulders and posteriorly to upper border of scapulæ. Both sphincters were paralyzed. In conclusion it was stated that it was probably the sixth segment of the cord that had been destroyed, though the lesion had probably also invaded the fifth. The fourth cervical segment had evidently escaped, thus permitting diaphragmatic respiration to continue many months. The

hospital, and died suddenly on eighth day of asphyxia while draw sheet was being changed on bed. No apparent injury to cord.

In a case of Gurling, quoted in Prof. Dixon Mann's Manual of Medical Jurisprudence, death did not ensue for twenty-eight hours after fracture of first three cervical vertebræ, although the cord was injured at the level of the third cervical vertebra. Here respiration must have been carried on mainly by sterno-mastoids and depressors of hyoid bone, as in Eve's case. But it is also to be noted that in an injury to the cord at the level of the third cervical vertebra the third anterior pair of nerves, and probably, at any rate, the [illegible] of origin of the fourth, will be intact. As the [illegible] nerve arise chiefly from the fourth pair, and commonly from a [illegible] of origin from the third, a partial action of the [illegible] [illegible] persist after an injury at [illegible]

[illegible]

level of the anæsthesia is about what one would expect to find in injury of the fifth and sixth cervical segments.

Horwitz[24] reports a case of fracture of second cervical vertebra with recovery. Paralysis symptoms came on late and lasted but a short time.

Peeke[25] reports fracture of fifth cervical vertebra from fall out of bed, with death following the next day, and it is thus described:

On the following morning dyspnœa increased; he gradually fell into a state of coma and died. Fracture was through the base of the fifth vertebra and there was extensive hemorrhage; respirations were diaphragmatic and hurried; complete paralysis of the lower portion of the body, extended up at first only to the middle of the breast. Upper extremities no loss of power.

Williams[26] reports a case of a man who had fallen 6 feet from a window:

He complained of pain over the back of the neck, in the region of the seventh cervical vertebra, and was completely paralyzed from his neck downward, including both arms and all respiratory and abdominal muscles, with the exception of the diaphragm. Loss of sensation over the same area, with exception of front of chest as far down as both nipples. All reflexes had disappeared. He was conscious and lived thirteen and a half hours. The left transverse process of the seventh cervical vertebra was completely torn away from the body of the vertebra, and at the posterior inferior portion of the body of the sixth vertebra a piece of bone half an inch long by a quarter of an inch broad was fractured, loosened, and pressing on the anterior surface of the cord, and partially occluding the lumen of the canal. The cord was flattened, surrounded by blood, and on section showed hemorrhages into its substance for the length of an inch opposite the lesion.

Smith-Clegg[27] report a case which is very similar to our own, in which there was a fracture of the odontoid process, similar fractures in the atlas, pulpy cord, and life sustained by artificial respiration for three and a half hours. The fracture of the odontoid process included the upper part of the body of the axis.

Mr. Eve[28] has collected 11 cases of fracture of the atlas, besides one of his own. In only one was death instantaneous, while complete recovery occurred in two. Mr. Eve points out that paralysis is "a less frequent or, at any rate, not so immediate a symptom as in fractures and dislocations of the spine lower down, owing to the larger amount of room for the cord in this region."

Dr. W. W. Gibson reports the case of a man with dislocation of the atlas forward living twenty-three days, and then dying suddenly from a redislocation, the cord being practically uninjured.

Lawson reports a case of fracture of the body of the axis with recovery and death ten years afterwards from other causes, when the body of the axis was found ankylosed to that of the third cervical vertebra and bent backward.

C. S. Wallace reports fracture of odontoid process and left superior facet of axis separated from the lower part of the body; walked to

ospital, and died suddenly on eighth day of asphyxia while draw heet was being changed on bed. No apparent injury to cord.

In a case of Gurling, quoted in Prof. Dixon Mann's Manual of edical Jurisprudence, death did not ensue for twenty-eight hours ter fracture of first three cervical vertebræ, although the cord as injured at the level of the third cervical vertebra. Here respiraon must have been carried on mainly by sterno-mastoids and pressors of hyoid bone, as in Eve's case. But it is also to be noted at in an injury to the cord at the level of the third cervical verbra the third anterior pair of nerves, and probably, at any rate, e upper fibers of origin of the fourth, will be intact. As the phrenic rves arise chiefly from the fourth pair, and commonly from a nch of origin from the third, a partial action of the diaphragm uld doubtless persist after an injury at this level.

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SUGGESTED DEVICES.

IMPROVISIONS TO FACILITATE URETHRAL IRRIGATION ON BOARD SHIP.

By Surgeon CHARLES M DE VALIN, U. S. Navy.

Figure 1 illustrates two percolators fitted as vesical irrigators, sliding on rods so as to give varying degrees of hydrostatic pressure. In connection with this irrigating apparatus the combined seat and catch basin, illustrated in figure 2, have been devised and, it is said, greatly facilitates the practice of this method of treating urethral diseases. The seat is found very useful and convenient and stows compactly. Figure 3 shows the manner of using the seat.

These improvisions on board the U. S. S. *Washington* are the outcome of a long-felt want in the tidy management of venereal cases requiring urethral treatment as well as those venereal cases of other character. Cotton and waste other than of liquid character, which drains into a pail, may by this means be collected dry and burned, and the danger of clogging valves and waste pipes, by the careless or accidental disposal of solid matter in lavatory basins, is obviated. They represent useful suggestions to those medical officers who have sought to have a special sink for venereal treatments installed on board ship.

FIG. 1.—PERCOLATORS AS IRRIGATORS ARRANGED TO SLIDE ON RODS.

FIG. 2.—SEAT AND CATCH-BASIN FOR USE IN PRACTICING URETHRAL IRRIGATION.

FIG. 3.—SEAT AND CATCH-BASIN IN USE.

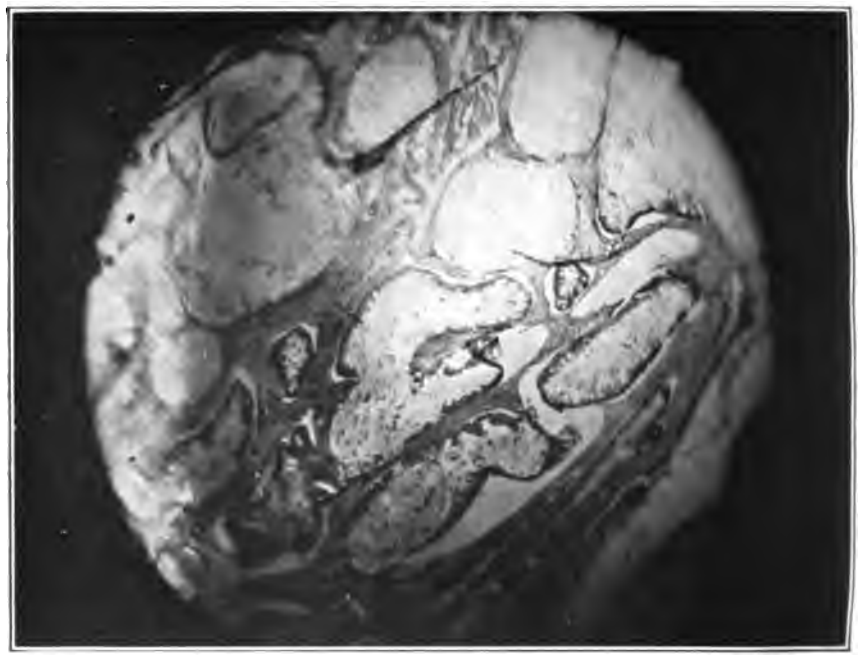

Fig. 1.

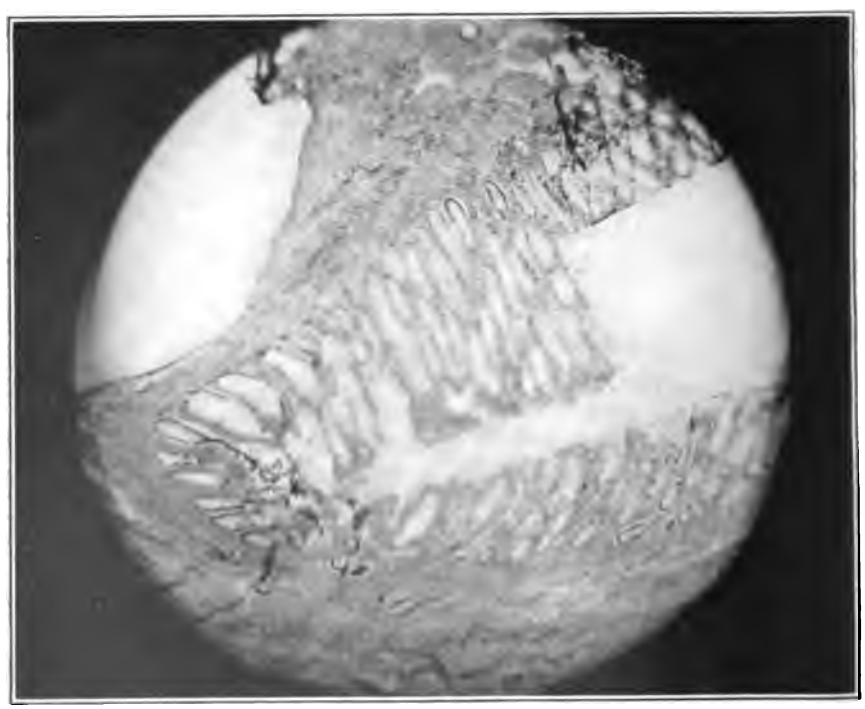

Fig. 2.

FIG. 1.—A SECTION OF GROWTH SHOWING GELATINOUS TISSUE IN AND ABOUT WOUND.
FIG. 2.—A SECTION OF GROWTH AT JUNCTION OF POLYP WITH INTESTINAL WALL.

CLINICAL NOTES.

A CASE OF CARCINOMA FOLLOWING APPENDICITIS, WITH THE POSSIBILITY OF A DIRECT INFECTION.

By Passed Asst. Surg. W. A. ANGWIN, U. S. Navy.

The case here reported was never under my direct care and, indeed, was transferred to so many stations that no one doctor was able to follow it to its conclusion; but it is so interesting that I have secured separate reports from each of the various attending surgeons, and obtained their permission to incorporate them in this paper. The case record is therefore a compilation.

C. Z., private, marine; age, 39; German. Family history, negative. Previous history: Had a slight attack of pain in the right iliac region while on duty in the Philippines, time unknown. Present history: While on duty in Cuba and when walking post on the night of November 5, 1906, he was suddenly taken with a severe pain in his abdomen, which prevented his completing the tour of duty. The next day his entire abdomen was tender, with extreme tenderness and pain in the right iliac fossa. The right rectus was rigid. Although there was no thermometer at the post, the presence of pus was suspected, and the patient was removed to the Civil Hospital, Cienfuegos, Cuba, for operation, which was performed on November 8. The "peritoneum and intestinal surface much inflamed. Large pus cavity found, in connection with the appendix, containing about an ounce of pus. Cavity dried out and drain introduced." Patient remained in this hospital for about two months, during which time he was dressed daily by the hospital attendants. (1.)

The American troops were, by courtesy, given accommodations in a ward of the Civil Hospital in Cienfuegos, and, although we attempted to keep the troops separate from the native patients, this could not always be done. In a bed of the ward was a native very ill from a supposed cancerous growth of the stomach. I have tried in vain to procure a more complete history of this case. It was inoperable. When the case of appendicitis was taken to the ward, he was put into the adjoining bed. During his convalescence he roamed freely about the ward and was quite careless about the dressing on his abdomen, permitting it to become loose and thus subjecting the wound to the liability of external infection.

The sinus never entirely closed, and on February 9, 1907, the patient was sent to the Base Hospital, Camp Columbia, Cuba, for transfer to the United States. "On February 11, 1907, he was admitted to this hospital with what at first appeared to be a simple fistula leading to the region of the appendix, and the opening appeared to be surrounded by exuberant granulations. A probe followed the sinus well down into the abdomen. There was considerable deep induration at this time and a moderate amount of pain. * * * Almost immediately after his admission here there was a sudden increase of the growth, i. e., the apparent 'granulations' became more extensive and harder and an ill-defined tumor became perceptible in the abdomen. Sections from the mass showed that it was a typical adeno carcinoma. It was undoubtedly of very recent origin * * *." (2.)

He was admitted to the Norfolk Naval Hospital on March 19, 1907. Examination showed a large protruding mass at site of operation wound, with thick foul discharge.

There was a gradual loss of strength and weight with intermittent attacks of pain at site of tumor, and bloody diarrhea and a gradual but pronounced increase in the size of the tumor until it reached "the size of a salad bowl, tightly constricted at its base by the margins of the wound. In its center was a depression which communicated with the lumen of the bowel. Patient had marked arteriosclerosis; both radial arteries were entirely obliterated and pulse could be felt only at fermorals and carotids." He died October 5, 1907, at the New York Naval Hospital. (3.)

Pathology: "Body much emaciated. The carcinoma extended through old incised wound of the abdomen. Growth was about 10 inches in diameter and elevated above the abdominal surface about 2 inches. It was slightly lobulated. * * * The deep origin of the cancer was from the cæcum of which it formed a part. It extended to the root of the penis and to the bladder. The neighboring mesenteric glands were involved. There were no gross lesions of other organs. The cæcum appeared to be the primary seat of the growth." (3.)

"The cæcum was firmly embedded in a mass of gelatinous tissue which extended into the abdominal wound. Within the cæcum was a connective tissue polyp about the size of an egg. This polyp showed distinct adenomatous degeneration. The adenomatous tubules passed along the stalk of the polyp to the outer layers of the intestine. From this point the growth was in two directions: First, it passed along the muscular and serous layers of the intestine, some of the tubules growing into the submucosa and giving the appearance of an adenoma infiltrating the intestine from without; second, the process spread outward, infiltrating the surrounding tissue and the abdominal wall. Here the tubules became cystic due to an accumulation of mucus. These large cytic spaces filled with mucus produced the gelatinous appearance of the tissue which surrounded the cæcum and appeared in the abdominal wound."

The pathological points of interest are:

1. Its origin in an intestinal polyp.
2. Its passage down the pedicle of the polyp to the outer intestinal wall with infiltration of the outer layers only of the intestine.
3. The extensive character and cystic appearance of the growth outside the intestine. (4.)

A summary of the report shows:

1. A history of previous appendicitis and an operation for an undoubted case of suppurative appendicitis.
2. A long convalescence caused by an unhealed sinus—a seat of irritation.
3. The presence nearby of a case of suspected carcinoma.
4. The appearance, later, of an adeno carcinoma in the wound and its rapid growth, leading to the death of the patient.

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FIG. 3.—GROSS APPEARANCE OF ADENO-CARCINOMA PROTRUDING AT SITE OF OPERATION WOUND.

A CASE OF LIVER ABSCESS; OBSCURE ETIOLOGY; OPERATION; RECOVERY.

By Passed Asst. Surg. G. F. FREEMAN U. S. Navy.

The following case of liver abscess is interesting on account of its obscure etiology and the indefinite symptoms at its inception.

MEDICAL HISTORY.

E. F. W.; P. M.; was admitted to the U. S. Naval Hospital, Portsmouth, N. H., September 28, 1907, as with hepatitis congestio. The service medical history was as follows: Patient was serving his second enlistment in the U. S. Marine Corps, having enlisted originally in July, 1903. During that year there was no sickness. During the year 1904 patient served on the Isthmus of Panama, suffering two attacks of malaria, one of four and one of eight days' duration. After returning from Panama patient was in the U. S. Naval Hospital, Portsmouth, N. H., from January 7 to March 3, 1905, with febris intermittens. (This continued malaria is not infrequent in patients returning from the tropics.) In 1906 patient was not sick, going to Cuba in September of same year and returning to Portsmouth, N. H., in July, 1907. During this tour of service in Cuba patient stated that "he had dysentery" for three days in April (1907), but that the disorder was not of sufficient severity to preclude the performance of his light police duties. He also stated that at that time about twenty of the same company were on the sick list with a similar ailment. It is thus seen that, except for this last diarrheal disease, there had been no sickness since March, 1905.

PRESENT ILLNESS.

The present illness began on August 4, 1907, with an attack of what appeared to be acute gastric catarrh, there being no symptoms indicating involvement of the liver. The gastric symptoms subsided, but the liver became enlarged and tender, and the temperature elevated. Later the temperature became normal, and the pain and tenderness ceased. The liver remained slightly enlarged, but otherwise there were no objective or subjective symptoms. On September 28 patient began to have distinct pain over the liver and a slight elevation of temperature. The liver enlargement increased, and the symptoms soon indicated a liver abscess. Patient's general appearance was "pasty," but at no time was there distinct jaundice. The stools were normal. There was a marked leucocytosis. No malarial organisms were found in blood. The liver dullness began at the fifth interspace in the mammary line and extended to 5 cm. below the costal border. There was a distinct tenderness on pressure at ninth costal margin and localized pain at this point. The tumor mass below the ribs was well defined. There was a slight hacking cough and slight expectoration; sputum negative. Examination of lung showed fine crack-

ling râles at right lower lobe, and a fine crepitus was heard, as of perihepatitis, around the site of pain and tenderness. The temperature curve is worthy of special observation. There was only a mild febrile reaction, showing a diurnal variation of from 1° to $2\frac{3}{10}$°, but it is characteristic of some cases of liver abscess. There were no chills or rigors and no periods of sweating. The appetite remained good, but there was considerable emaciation. On some days the temperature was normal, and only on one day did the temperature reach 101. The temperature chart illustrated the fact that a large liver abscess may exist without any extreme pyrexia. Still, there is that slight continued elevation and depression which, considered in conjunction with the other symptoms, becomes characteristic. Cases of liver abscess previously seen have had a more irregular temperature. Following operation the temperature immediately dropped to normal and remained so. The pain was distinctly local, and, from the symptoms, a suppurative process of the gall bladder could not be excluded. In either case operative procedure was indicated.

OPERATION.

Ether anæsthesia. The usual subcostal incision was made as the tumor mass presented below the ribs. Adhesions were found and the abscess opened immediately, one suture being passed at lower edge of liver incision for safety. The abscess was apparently single, and no pockets were found by the exploring finger. A rubber drainage tube was inserted, with gauze packing. The abdominal incision was closed and a large dressing applied. The estimated amount of pus was 12 ounces. Following operation the temperature became normal, and the pain and cough ceased. The drainage tube was continued three and a half weeks, being gradually shortened. Convalescence was uneventful. The examination of pus was negative for amœba, the original pus being examined, and the pus from drainage tube at subsequent dressings.

The etiology in this case is doubtful. There is a history of possible slight dysentery for three days five months prior to the abscess of the liver, but otherwise there had been perfect health for two years. The disease appeared at first as an acute gastric catarrh with symptoms of cholecystitis following. Liver abscess was considered from the first, as is usual in those who have had tropical duty. Malaria was not present when disease appeared. It is probable that the cause of the abscess was a latent infection received from the mild attack of dysentery five months before, and precipitated by the acute gastric catarrh and cholecytitis.

COMMENT.

From the size of the abscess it is believed that pus could have been found some time before the actual operation was performed. The symptoms were not conclusive of liver abscess, but conformed to an

abscess or an infection of the gall bladder. In this case the patient's condition remained good; the abscess was single and did not indicate a severe infection. An exploratory operation in such cases is not dangerous and saves much time. By "exploratory" in this case is meant actual incision of chest or abdominal wall; examination of liver; and then the use of an exploring needle, if necessary. In the several cases of liver abscess seen, the tendency has been to wait too long before operation rather than explore too early. It is considered that the sooner a liver abscess is found the better the chance of preventing widespread infection and the formation of other abscess pockets; the patient's condition is better for operation; and the ultimate results show a lower mortality. On the other hand, it is much easier to give post-operative opinions than to bravely operate when the diagnosis is not certainly established. One case is recalled in which a large abscess in the right lobe was found and believed to be the only pus accumulation. It developed ultimately that there were three other large abscesses of liver, including one in the left lobe, and the patient died. All of these were such as result from dysentery and not of the multiple pyæmic variety. The case was not seen early in disease, and it is opined that if the first large abscess had been early discovered and evacuated there might not have been others. The experience just cited is always remembered when a new case comes under observation, and the hope is entertained that the abscess in question may be single. In suspected liver abscesses *explore early*. Delay means more danger to patient than an operation. *It is better to explore too early in some cases than to operate too late in others.*

PURPURA (PELIOSIS RHEUMATICA.)

FIRST CASE, FROM U. S. S. WOLVERINE.

By Surg. A. G. GRUNWELL, U. S. Navy.

On June 16, 1906, P., H. D., apprentice seaman, was admitted to the sick list with this disease. A previous attack, when the nature of the malady was not understood, occurred during the latter part of March. The last attack began with the sudden appearance of a bright red erythematous rash covering almost the entire body, but deepest and most developed upon the lower abdomen and about the knees. Simultaneously the knee joints, especially the right one, became stiff and, within a day or two, were considerably swollen and very tender upon movement. A careful examination of the skin eruption revealed, on the outer side of the right calf and just below the knee, an old spot of blood extravasation, not quite as large as a dime, remaining from the first attack. During the course of the next four or five days the eruption changed considerably in character, in some situations, as about the knees and axillæ, becoming herpetiform

and exuding serum, while on the lower abdomen it became distinctly macular, dark, and not entirely disappearing under pressure. Considerable œdema developed in both legs, but disease of neither the heart nor of the kidneys could be made out. On the fifth day the pain had largely disappeared from the knees, and the eruption was fast fading, this favorable condition, with desquamation about the knees, continuing until the eighth day, when the left knee became again suddenly inflamed. On the ninth day the right hip joint was involved and a few urticarial spots were visible on the upper part of the right thigh. On the tenth day the pain had disappeared from the right knee and was much less in the right hip joint, and after two more days he was believed to be convalescent, the eruption, also, save a few brownish spots on the lower abdomen, having about disappeared. Suddenly, however, on the thirteenth day of the disease both hands became greatly swollen, the finger joints all painful, and both hip joints again involved. There was no reappearance of the eruption, however, and the next day the pain had greatly decreased. From this time all symptoms rapidly subsided, and now (July 8) he is doing duty again and seems to be none the worse for his experience. The heart was carefully watched, but seemed to be normal throughout the disease.

Never during this attack nor during the preceding one in March did the temperature rise above 99° F., and this fact, together with the behavior of the lymphatic glands at the time of the outbreak of the eruption, is considered to be rather remarkable. All the cutaneous glands, those of the groin, axilla, etc., became sore and swollen, as though infected; but there was neither chills nor fever and, as the eruption paled, the glands returned to their normal state. Desquamation was extensive, especially about the knees and hands.

The treatment administered, in addition to diet and absolute rest, consisted of the salicylates and the tincture of iron, with cod liver oil during convalescence. Whether or not the salicylates had any effect in shortening the course of the disease is doubtful, although they seemed to lessen the pain.

SECOND CASE, FROM U. S. S. VERMONT.

By Surg. F. M. Furlong, U. S. Navy.

The patient, a warrant officer, was admitted on November 20, 1907. He stated that during the night before he had experienced chilly sensations and myalgic and arthritic pains, as if he had taken "cold." On attempting to get out of bed the following morning he felt so prostrated that it took all of his reserve energy to dress himself. When seen by the medical officers of this ship, the day of his admission, the following symptoms were noted: Temperature, 100°;

pulse, 90; respiration, 20. There was some headache, backache, and mild pains in both wrists, elbows, knees, and ankles. On examining his throat the fauces were observed to be fiery red and there was a sharp line of demarcation between these regions and the sound tissue, instead of a gradual fading of the inflamed area into the surrounding parts, as would naturally be expected. On both wrists, hands, ankles, and feet were found a profuse blotchy erythematous eruption, varying in size from a pin head to a 10-cent piece. History was negative in regard to syphilis and rheumatism. In view of the above symptoms a provisional diagnosis of peliosis rheumatica was made.

During the day it was noticed that the body was bathed in a profuse sweat which gave an acid reaction. The urine contained a trace of albumin. His evening temperature was 102°. As the affection showed no signs of abating he was transferred to the U. S. Naval Hospital, Chelsea, Mass., on November 23. While under observation and treatment on board the ship, his temperature ranged from 101° to 102°, and on the last day he had a mild epistaxis. Red spots developed, also, on the thighs and back, together with an ecchymosis of the left upper eyelid, and swelling of the right knee joint.

The diagnosis of "peliosis" was confirmed by the medical officers of the hospital and by a well-known Boston specialist, who was asked to see the case as a matter of interest. The patient made an uninterrupted recovery, and was returned to duty on December 7. He states that he still has some mild pains in the hip joints, and the hands and feet are now desquamating. The case is of interest because the disease is rare, and is, indeed, only the second seen by the writer in ten years. It appears to have been a typical one, according to the works consulted.

Peliosis rheumatica was formerly classed as a variety of rheumatism, but Osler has placed it among the purpuras.

SEVERE CASE OF GLOMERULAR NEPHRITIS, TREATED SURGICALLY AND RESULTING IN A "CLINICAL" CURE.

By Surg. H. C. Curl, U. S. Navy.

[illegible] male; age 22; machinist by trade. Family history unimportant. Personal history negative, except that he says he had a venerial sore in January, 1907, and was treated for syphilis from that date until admission to hospital March 22.

Upon admission case was apparently one of acute glomerular nephritis, the urinary examination showing 2 per cent dry albumin, "*very many* hyaline and granular casts, renal cells and much fat adherent."

In spite of medical treatment he grew worse, the œdema increased, and urine became scanty and solidified upon boiling. Pleuritic fluid

was removed on numerous occasions, 2,000 c. c. being the usual amount withdrawn. On September 5 patient was simply an œdematous, water-logged mass, passing about 300 c. c. of urine daily and with occasional uremic manifestations.

On September 6 the Edebohl operation was performed. Some difficulty was experienced in getting through the very œdematous tissues of the back and reaching the kidney; otherwise the operation presented nothing of interest. Reaction was prompt, and from the second day following operation the improvement was phenomenal; the urine rose to 3,000 c. c.; the œdema cleared up; and he was in every way greatly improved. He lost about 50 pounds in a month, but after the fluid in the tissues had been taken up began to gain in a normal way, and now weighs 175 pounds. The urine continued to show albumin for some time, but it has steadily diminished until now (January, 1908) there is only the slighest trace, as shown by the most careful examination.

This case, then, is one of, at least, an "apparent cure." The literature on the subject is voluminous and discouraging, and many of the best surgeons are not in favor of the operation. If, however, all or even a majority of cases of kidney decapsulation turned out as well as this the efficacy of the operation would no longer be questioned.

A CASE OF ANEURYSM (Aortic).

By Asst. Surg. P. R. STALNAKER, U. S. Navy.

A. B.; oiler, U. S. Navy; U. S. S. *West Virginia;* was admitted to the sick list on August 30, 1907, complaining of persistent cough. Physical examination at date of admission revealed the fact that some obstruction existed in his chest which prevented the easy accomplishment of the respiratory act, more especially that of the right side, the right bronchus seeming to be very seriously obstructed. The physical signs of aneurysm, save a small area of abnormal dullness over the sternum, just to the right of the aortic area, though repeated examinations to elicit symptoms and signs of such condition were made, were lacking. At 12.30 p. m., September 26, 1907, he experienced a violent attack of coughing, and immediately following this a copious hemorrhage from the lungs caused death.

The autopsy, which was held at 4 p. m. the same day, showed all organs to be normal, except the heart, which was very small, and the ascending, transverse, and 2 inches of the descending parts of the aorta, which were involved in a large fusiform aneurysm that pressed on both bronchi. This aneurysm had ruptured. The lungs were filled with tubercular nodules, and there was a large tubercular cavity in the right apex. The pleura of both sides was extensively

adherent and the escaping blood and serum consequent upon the rupture of the aneurysm filled the entire nonadherent spaces.

Previous history of case, as far as could be elicited, was negative. The deceased was a native of Germany and was 37.5 years old.

A CASE OF RUPTURED VISCUS (Spleen).

By Medical Inspector P. A. LOVERING, U. S. Navy.

V. J.; ordinary seaman; U. S. Navy. About 6 a. m., December 9, a boat was being lowered on the U. S. S. *Connecticut* at Hampton Roads, Va., when an eyebolt broke and precipitated boat and crew into the water, the latter sustaining various injuries. This patient was admitted to the Norfolk Hospital on December 9 at 3 p. m. with symptoms of internal hemorrhage and with a dislocated left shoulder. He was operated upon at 7.30 that evening and the spleen found to have been ruptured in several places. Prior to and during the operation there was no radial pulse, and the man was kept alive by saline transfusions. He rallied fairly well after operation, ran a precarious course for six days, and died at 8.45 p. m., December 15, of exhaustion due to a weak heart and persistent hiccough.

Autopsy showed seven tears in spleen, five of which had partially healed. The other two were extensive and passed through the hilum from top to bottom. The liver was very small and hard; the right kidney was very pale, the left had been bruised by the fall and was hemorrhagic; the stomach and intestines were greatly distended with gas; there was a tear in the peritoneal coat of the colon at the hepatic flexure; the lungs showed hypostatic congestion.

CURRENT COMMENT.

It is to be remembered that in the publication of these comments the Bureau does not necessarily undertake to indorse the opinions expressed, but will lend the pages of this section to discussion of such contemporary topics as will be of interest and value to the service.

The attention of medical officers is invited to the new form "Report of Examination; Hospital Corps," which is to be issued in the near future. The changes involved seek to correct the defects which experience with the old form has brought to light, particularly the frequent delay in giving qualified candidates acting appointments in the new rating. The instructions direct that one copy shall be addressed to the commanding officer of the ship or station where the men's accounts are kept and plainly marked "Commanding officer's copy;" and one copy shall be sent to the Chief of the Bureau of Medicine and Surgery.

Surg. C. W. De Valin, U. S. Navy (sanitary report, U. S. S. *Washington*, for the year 1907), calls attention to an occurrence on board that ship which represents possibilities of more or less serious annoyance and inconvenience, if not danger. He reports that—

In September, 1907, an extremely offensive odor which had been noticeable for some time in the wardroom and quarters was traced to certain cofferdam compartments situated under the wardroom, messroom, and staterooms. When these cofferdams were opened much of the cellulose was found in various stages of decomposition, ranging from slight discoloration at the top to a mass of black ooze at the bottom. This latter gave off so overpowering a stench that the men employed in its removal were worked in short shifts. During this time (several days) the living spaces adjoining were uninhabitable and the gases turned the paint work and the metal substances in the vicinity quite black.

The characteristic foul odor of the gas emitted and the fact that it blackened paint work and metal would indicate that the gas was hydrogen sulphide, probably generated under the action of heat, in the presence of water, from foreign substances in the nature of sulphide compounds contained in the cellulose.

This is not the first time such a deterioration has taken place in the cellulose packing of cofferdams, and the information may not be amiss in guiding to the source of obnoxious gases should the experience be repeated on other ships.

According to Rohé (Text-Book of Hygiene, second edition, p. 215), writing on the subject of hydrogen sulphide—

* * * The gases resulting from the putrefied decomposition of organic substances, such as are found in tanneries, glue and soap works, and similar industries, are popularly believed to give rise to various diseases. There are no observations on record, however, to show that such is the case. As a matter of fact the workmen engaged in the enterprises mentioned seemed to be exceptionally healthy and to resist to a considerable degree the ravages of phthisis and epidemic diseases.

Asst. Surg. George M. Olson, U. S. Navy (sanitary report U. S. S. *Galveston*, for the year 1907), gives us an interesting note on the origin of a certain skin eruption which he has observed among those serving in Chinese waters and which he has called "Ningpo varnish poisoning." He says:

Ningpo varnish contains, along with some 40 other ingredients, the active principle of poison ivy or poison oak. A great deal of this varnish is used in Chinese ports to finish windows and articles of furniture, etc., and the poisonous principle is present for months after the varnish has dried. A number of cases of poisoning from this varnish have occurred among the personnel of this ship. Most of the Chinese appear to be immune. After the slightest contact with the varnish susceptible persons develop an extensive, small vesicular rash, such as seen in cases of poisoning from ivy itself.

TATTOOING IN THE NAVY, AS SHOWN BY THE RECORDS OF THE U. S. S. INDEPENDENCE.

By Surg. A. Farenholt, U. S. Navy.

Probably no class of persons has the opportunity to see such an amount and variety of tattooing as that upon whom the duty of physical examination for a military or naval service devolves, and undoubtedly the latter presents the richer field. Why this form of personal adornment should be so popular with those whose profession it is to follow the sea is difficult to explain; but custom and sentiment without doubt keep alive a practice which, in the early days, was the mark of a true deep-water sailor and a necessary requisite to the beau ideal. The custom probably originated among the natives of the south-sea islands where at one time it was almost universally in vogue, whence it was carried by admiring voyagers to home ports and in turn imitated by the envious. The name is considered to have been derived from the Tahitian word "tatu," of the same meaning.

While tattooing originated as an adornment of uncivilized peoples, it is far less common among them to-day than it was formerly, partly through the influence of missionaries; partly, also, through the influence of public sentiment; and partly through Government inter-

ference, as is at present the case in Japan. On the other hand the total extent of this habit has probably never been greater than it is at the present time. Although it may be there is a slight decrease in the percentage of tattooed persons who adopt the sea as a means of livelihood, there is certainly a marked increase among those who travel and even among those who live at a distance from the influences of the sea. There is hardly any large city but has one or more professional tattooers, often ex-man-of-warsmen or Japanese, who advertise freely and who cater to the lure of this fascination.

Lombroso states that few people, with the fortunate exception of sailors, are tattooed who are not of the criminal class or degenerate. While on shore it is probable that the custom is chiefly confined to the lower orders of society, the same can not be said of the seagoing population. I have recently examined the enlistment records of 3,572 men, being the enlistments on this vessel for a period of eight and one-half years, and have obtained the following data for that portion of our enlisted force:

Percentage of men found tatooed on examination for second and subsequent enlistments	53.61
Percentage of men found to be tattooed on examination for first enlistment	23.01

While the former figures give a fair estimate of tattooing among the "old timers," it is a trifle under the correct estimate for the service as a whole, and I think it would be nearer the truth to say that about 60 per cent of persons who have served over ten years are thus marked. On the other hand it is not fair to assume that 23 per cent of all male civilians are tattooed because that was found to be the percentage among those who presented themselves for first enlistment, as a considerable proportion of applicants are seafaring men and as it is probable that some men conceal previous service. On inquiry, however, I have been surprised to find so many, probably 8 per cent of the recruits, who are tattooed and who deny having been at sea or even having lived in seaport towns. I think the custom is more common in camps and in places where men are collected in large numbers than is ordinarily imagined.

The designs were found to have been placed in the following locations according to numerical preponderance: (1) Forearms; (2) arms; (3) chest; (4) shoulders; (5) hands; (6) wrists; (7) legs; (8) feet; (9) back; (10) face; (11) penis.

The conventional designs in order of frequency were the following: (1) Letters; (2) coats of arms; (3) flags; (4) anchors; (5) eagles and birds; (6) stars; (7) female figures; (8) ships; (9) clasped hands; (10) daggers; (11) crosses; (12) bracelets; (13) hearts.

Letters, mottoes, initials, and allied devices lead the list and constitute about 26 per cent of all ink marks. Coats of arms and national emblems follow with about 25 per cent, then flags, anchors, etc., as is

shown by the list above. Female figures are shown in 18 per cent of all tattooing; but if all figures in which women are shown, such as nude women, Gibson heads, sailor and girl, and portraits, are included, the percentage rises to 33, one in every three men tattooed selecting a design, some part of which is a female figure. Less than 1 per cent show indecent subjects; almost invariably such designs have been covered by other work, as also frequently have letters, names, and the once common tombstone scene. The usual types were found, among them, such as: H O L D F A S T (a letter on the back of each finger); apprentice knot; pig on dorsum of foot, which among the older men was supposed to shield its possessor from death by drowning; crucifix, which in case of death would insure Christian burial in a Christian country, and "Jerusalem cross," which would answer the same purpose on Moslem shores. Of the latter there were 14, all in reenlisted men. One man was adorned with a sock covering each foot and extending above the ankles; another with a fox-hunting scene, the dogs in full cry over the abdomen, up over the shoulder, down the back, and the fox almost reaching the buttocks. The entire back was covered in one case by a large Masonic column and globe. "Little Egypt" figured in two cases and a copy of a Schlitz beer trade-mark in one. The penis was found to be tattooed in 7 cases, 3 on the glands and 4 on the sides; one of the former represented the American flag. The following designs were found to be more popular on reenlistment than among those who came directly from civil life: Goddess of liberty, ships, eagles, pigs, and apprentice knots.

THE SICK SPACES ON BOARD THE JAPANESE CRUISER TSUKUBA.

By Asst. Surg. R. A. WARNER, U. S. Navy.

The accompanying diagram was drawn by the author from memory, but he believes it to be correct in every important particular. Statements anent features which the writer could not verify are made on the authority of the Japanese surgeon.

The *Tsukuba* is one of the recent Japanese-built armored cruisers, and her construction embodies the points gained through battle experience in the Russian war. This experience has brought about a great deal of benefit in establishing permanent and specially constructed battle quarters for the surgeon. Some little explanation of the manner in which the everyday work of the medical department is carried on in time of peace is first necessary.

This they call their "normal" work, and it is carried on in a sick bay and dispensary, situated on the gun deck and not protected by heavy armor. Though the *Tsukuba* carries 900 men, there are in the sick bay but 8 beds. These are iron cots swung on gimbals and are of the same pattern as those used by the English. Connected with

the sick bay is a suitable bath and head. The dispensary is complete and carries on the everyday "normal" treatment of the sick. Here there is a more complete dental outfit than is carried on our ships, and the hospital stewards are given a course in emergency dentistry before being sent to sea. There is no operating room in connection with the sick bay, minor operations being performed in the dispensary, where there is a plain table for this purpose. Everything is neat and clean and in arrangement corresponds to our own compartments, excepting the number of cots provided for the sick and the absence of a special isolating ward for infectious diseases. In time of battle the "normal" sick bay is abandoned as being too exposed.

On this ship, as seen by the accompanying diagram, two large compartments, situated on either side of the forward 12-inch barbette on the berth deck, are designed for the primary dressing stations. The position is behind the main armor and below the water line. They are symmetrically arranged and of equal size. The port compartment is the main operating room of the ship and is permanent. It is about 20 by 18 feet in size, has a tiled deck, and the bulkheads are smooth. Plain incandescent lamps are in sufficient number to give good light. The operating table is of enameled iron, similar to our own. Beginning forward on the outboard side, there is first a complete photographic outfit, an X-ray outfit, and a space for the stowage of dressings. Running inboard along the after bulkhead are sterile-water tanks, a large dressing sterilizer, an instrument sterilizer, and two running-water wash basins. Sterilizers are connected with the steam system of the ship. There is no instrument cabinet provided. Adjoining the operating room, but unconnected with it, there is a large storeroom for medical and surgical supplies. This location of the storeroom affords protection for supplies under all conditions and is very desirable.

The starboard compartment is a bare, tiled deck room designed as a safe resting place for the wounded, who have been dressed, while the action continues.

Between the two compartments is a large hatch, running up through the gun and main decks, which, according to plans, is to be used as a direct communication in transporting the wounded. The surgeon of the ship said they had improvised an elevator operated by an electric winch, but that its trial was unsatisfactory, as it worked only fairly well and shook the patients a good deal.

About the after 12-inch barbette on the same deck there are two similar compartments, but they contain no fittings and were being used as storerooms. They, however, are available in war time for medical-department purposes and would then be fitted as the after dressing station, with supplies from the "normal" sick bay.

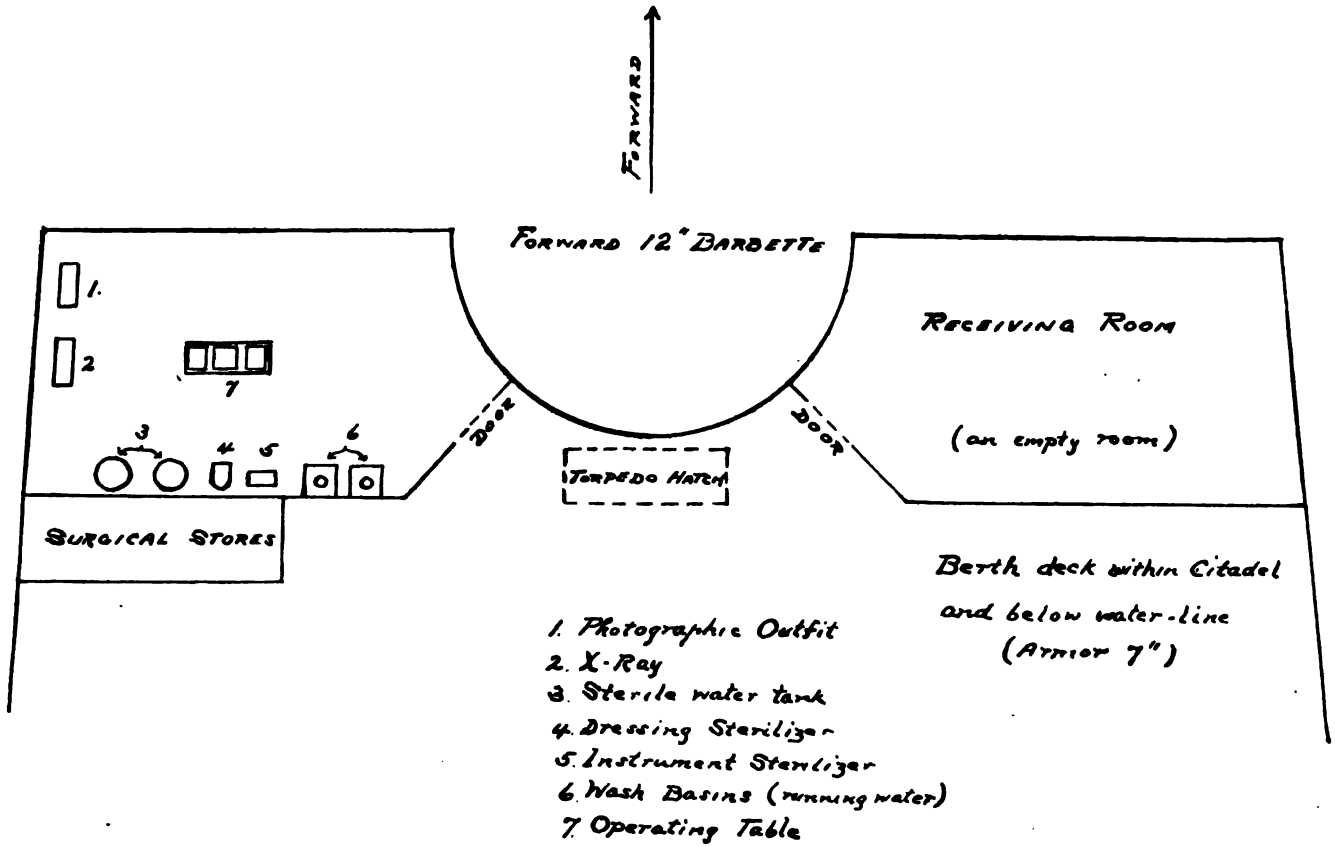

FIG. 1.—DIAGRAM OF TSUKUBA'S PROTECTED SICK SPACES AND POSITION OF FITTINGS.

PROGRESS IN MEDICAL SCIENCES.

CHEMISTRY AND PHARMACY.

By Asst. Surg. E. W. Brown and Pharmacist P. J. Waldner, U. S. Navy.

CLINICAL METHODS FOR THE DETERMINATION OF THE ALKALINITY OF THE BLOOD; A REVIEW.

1. Gamble. Journal of Pathology and Bacteriology, 1906, Vol. XI, No. 2, p. 124.
2. Moore and Wilson. Bio-Chemical Journal, 1906, Vol. I, Nos. 6–7, p. 297.
3. Wright. The Lancet, London, 1897, No. 2, p. 719.
4. Wright. The Lancet, London, 1900, No. 2, p. 565.
5. Luff. British Medical Journal, London, 1898, No. 1, p. 1066.
6. Beddard, Pembrey, and Spriggs. The Lancet, London, 1903, No. 1, p. 1366.
7. Pugh. Journal Mental Science, London, 1903, Vol. XLIX, p. 71.
8. Strauss. Johns Hopkins Hospital Bulletin, 1907, Vol. XVIII, p. 221.
9. Hutchinson. The Lancet, London, 1896, No. 1, pp. 616 and 1166.
10. Dare. Johns Hopkins Hospital Bulletin, 1903, Vol. XIV, p. 175.
11. Engel. Berlin Klin. Worch., 1899, bd. 35, p. 5308.

This subject has assumed increased importance in recent years, owing to the fact that the early recognition of acidosis is of the utmost significance for the diagnosis, prognosis, and therapy in such diseases as pernicious anæmia, diabetes, leucemia, carcinoma, etc.

In view of the recently renewed interest and discussion of this matter it appeared desirable to introduce, if possible, reliable methods of hæmoalkalimetry of clinical application in the laboratory course of instruction at the United States Naval Medical School. Owing to the limited clinical facilities on board ship, a plan of the simplest technique, requiring a minimum of apparatus, would be most desirable.

A brief survey of the very extensive literature on hæmoalkalimetry will convince one that an entirely satisfactory method has not yet been proposed. Studies of certain features of recent methods with a view to improvement in accuracy and simplicity are now in progress at the Naval Medical School laboratory. It is hoped that the results may be published in the near future. The present paper has reference only to certain aspects of the more recent literature of the subject. The determination of the reaction of the blood and its degree of alkalinity or acidity is a subject beset by great difficulties, both experimental and theoretical, as is shown by the great number of methods which have been introduced for the purpose and the divergent results reported. Thus Gamble[1], who has assembled data

from the literature for the so-called "normal alkalinity of the blood," has shown an astounding range of 181–253 to 620 expressed as milligrams of sodium hydroxide per 100 c. c. These data are taken from 27 different authorities, the earliest being reported in 1878 and the latest in 1903.

As the blood alkalinity in disease varies within relatively narrow limits, it is evident that the amount of inherent error in any method is to be carefully considered in view of its bearing on the accuracy, and hence the clinical value, of the results. Extreme accuracy is more imperative here than in the case of many other clinical procedures, as the variation inherent to the method must not include within its limits the changes seen in those diseases in which the prompt recognition of acidosis is of value.

The experimental difficulties are represented by the color and complex nature of the blood; the presence of proteids which react as acids or bases, according to the indicator used to show the neutral point; and the peculiarly balanced phosphates and carbonates of alkali metals present, which act in a similar manner. To quote Moore and Wilson[2]:

> The theoretical difficulties are caused by a general haziness which surrounds the literature of the subject as to what constitutes a neutral reaction in a fluid. It is only recently that advances in physical chemistry and improvements in methods of determining ionic concentrations have begun to shed light on the results of determinations (by means of colored indicators) of what was formerly supposed to be alkalinity or acidity, and to show that the reaction lies not very far from the neutral point. * * * Our physical methods are at present not sufficiently delicate to determine the values of hydrogen and hydroxyl ionic concentrations lying around equality, and we still must use the titration methods, as the titrations may be taken as roughly proportional among themselves to the ionic concentrations.

The older experimental results vary according to whether the reaction is taken in the whole blood or in the plasma or in the serum, and still more according to the indicator employed. The various methods deal with either the unlaked blood, serum, or laked blood. It appears to be settled that the greatest difficulties are met with in the unlaked blood, while no advantage is derived, as the reaction of the plasma varies but slightly from that of the serum. The alkalinity of the laked blood is stated to be much higher than the serum, as it is claimed by some workers that the corpuscles contain much larger amounts of alkali than the plasma. The question now arises: What light do the results of work on the serum shed on the alkalinity of the whole blood? Gamble questions the value of this, while Wright uses the serum in preference to the whole blood, because (1) the red cells do not interfere, and (2) from a clinical point of view the alkalinity of the serum is more important, as it comes in such close contact with the tissues, and may be taken as an index of the changes taking place in the circulating blood.

Method of Wright [3]: Although published in 1897, this method has received comparatively little attention and has been strangely neglected in American text-books on clinical diagnosis. It may be described as follows: The blood is drawn from a finger into a capsule, one or both ends of which are sealed. It is then allowed to stand for from three to twenty-four hours. When the blood has stood until a condition of constant alkalinity is reached, it is titrated. Titration is made by means of capillary pipettes like those used in the opsonin work. Solutions of N/20, N/30, N/40, N/50, and N/60 sulphuric acid are prepared. The titration is made against delicate red litmus paper (Grübler's) prepared in a special manner. Equal volumes of serum and acid are drawn up into the pipette and mixed by blowing them into a watch glass and then thoroughly respirated. A drop of the mixture is now put upon a strip of litmus paper. If this is still acid, the same procedure is carried out with equal volumes of serum and the next lower dilution of sulphuric acid and the process repeated until the mixture shows an alkaline reaction. When this is obtained with equal volumes of serum and, say, N/30 acid, an intermediate solution of N/35 acid is made with equal volumes of N/30 and N/40 acid, and the titration is repeated with this dilution. No attempt is made to titrate with acids varying by less than a five-fold dilution.

Wright [4] later applied his method to the blood of various pathological conditions with satisfactory results. Luff [5] considered the method reliable for measuring the alkalinity in gout; Beddard, Pembrey, and Spriggs [6] reported its application in numerous cases, and Pugh [7] in certain organic nervous diseases. Strouse [8] has recently tested the method using litmus paper. He states:

> The relative insensitiveness of litmus in the presence of carbonates was a constant source of trouble in the exact determination of the saturation point; for example, with a mixture of serum and N/35 acid there would be a faint purple tinge to the drop on the litmus paper, while with N/40 acid the drop would be blue. Having determined a fixed point in this gradual change of color from red to blue as our end reaction, we made it a rule to repeat each titration one or more times, and it was here that the shortcomings of the method were most apparent in the nonconcordance of the results of repeated titrations of the same specimen at intervals of only a few minutes. Frequently the difference of reaction caused by a change from N/35 to N/40 or N/45 acid was so slight that a great element of imagination was necessarily introduced. If we express the terms N/35, N/40, and N/45 as actual sodium hydrate, this variation amounts to 14 to 22 per cent.

Strouse emphasizes the well-known chemical fact that litmus does not correspond in neutrality to any definite point in the titration of carbonates and phosphates, giving neutrality with carbonates when there is a certain excess of carbonic acid above that necessary to form bicarbonate, and neutrality with phosphates at an intermediate point between the primary and the secondary phosphates. According to Hutchison [9] the inconstant factor of the viscosity of the blood

also influences the saturation point of litmus paper. Buckmaster, in describing the method of Wright in his text on the morphology of the blood, refers to the normal value of the blood alkalinity, i. e., N/35 as equivalent to 530 milligrams per 100 c. c. of blood. This figure represents a miscalculation, as 100 c. c. of an N/35 acid is really equivalent to 114 milligrams.

A method which has attracted considerable attention was published by Dare[10], of Philadelphia, in 1903. It is based on the assumption that the characteristic spectrum of oxyhæmoglobin loses its absorption bands at the exact point of neutralization when titrated with a solution of tartaric acid. He remarks:

* * * We have in the blood a *natural indicator* observed with the spectroscope up to the exact point of departure which we assume is the point of neutralization.

Gamble, working at the Victoria University of Manchester, reports that the principle of the method is fallacious and the calculations erroneous. Thus Dare records the normal alkalinity of the blood by his apparatus as 266 milligrams, which figure on the basis of correct computing should be 2,660 milligrams, a result obviously too high, as the blood would then contain over 2.5 per cent of alkali in terms of sodium hydroxide. Vale, of Washington, in conjunction with Hodge, independently called attention to the same inaccuracy.

The writer has recently tested this method in the clinical laboratory of the Naval Medical School. The microspectroscope was found to be easier of manipulation and more satisfactory in results than the hand instrument heretofore used. The criticisms of Gamble and Vale were confirmed, i. e., the alkalinity values are remarkably high. While approximately 2 c. c. of an N/200 tartaric-acid solution were required to cause the disappearance of the oxyhæmoglobin bands in normal blood, less than 1 c. c. was uniformly required to actually neutralize the fluid.

Gamble has published an elaborate study of the method of Engel[11], whose procedure directs that the blood be drawn into a capillary pipette graduated to 50 cubic millimeters, diluted and laked in a special mixing chamber with water to 5 c. c. It is then titrated with an N/200 acid solution, using lacmoid test paper prepared from a one-third saturated alcoholic solution of the indicator. Gamble introduced slight modifications and, on the basis of an extensive number of analyses, decided that it yields results at once comparable and of probable utility. He admits, however, that the operation is not entirely satisfactory in that one determination alone is not sufficient, but the column of results for the average daily alkalinity indicates a fair degree of accuracy for the method. The other conclusions drawn were that it is not necessary to titrate with an organic acid, as has been so frequently stated, for a dilute inorganic acid does not precipitate albumin in sufficient amounts to influence the results;

that lacmoid is the most sensitive test paper in comparison with a number of other common indicators; that albumin is found to have a marked influence on *indicators* in solution.

It occurs to the writer that a serious criticism of the Engel-Gamble method is the high multiplication of error. Thus, to compute the the alkalinity of the blood per 100 c. c., and using N/200 sulphuric acid for the titration, the experimental error is magnified 2,000 times. He fails to state the highest degree of sensitiveness of his lacmoid test paper. An error of 0.1 c. c. on the pipette reading introduces a difference of 40 milligrams in the calculation for 100 c. c. of blood. For every 0.01 c. c. added to 5 c. c. of the laked blood mixture, a test paper must be sensitive to 1:250,000 sulphuric acid. The procedure is much more difficult of execution than Wright's plan, particularly when a large number of estimations are necessary, and it may be at present questioned whether it is the superior in results.

Moore and Wilson[2] have recorded a method which includes the principle of Wright's operation. In place, however, of employing test paper, the indicator, in this case di-methyl-amido-azo-benzol, is added in fixed quantity to the various dilutions of the normal sulphuric acid and the mixture blown upon a porcelain plate. The change of reaction is reported as very sharp. The acidic reactivity of the entire serum to phenol-phthaleïn and the basic reactivity to di-methyl-amido-azo-benzol was determined in (A) normal individuals, (B) cases of malignant disease, and (C) cases of debility from other causes. Values were also obtained for the basic reactivity to "di-methyl" of the inorganic salts of the serum after removal of the proteids by incineration. The latter procedure is of interest in showing the relation of the proteids of the serum to so-called alkalinity. Evidence is adduced that there probably exists an absorption or combination between the proteids and the total inorganic salts of the plasma which regulates the total amount of such salts in the plasma.

In the case of the "di-methyl" titrations a very interesting and high value was obtained which showed that the proteids of the serum acted as bases, and were completely combined with acid before this indicator reacted. Thus the figure obtained for the normal serum was 0.170 to 0.180 normal, which indicates, in addition to the reactivity of the inorganic salts, the reactivity of the proteins or, in other words, their power of combining with acids. The reactivity of the inorganic salts alone after the removal of the proteids was found to be 0.030 to 0.038; using these figures the value of the reactivity for the proteids alone is obtained as 0.140 to 0.142 normal.

Moore and Wilson emphasize the value of di-methyl-amido-azo-benzol as an indicator and its superiority to litmus in this connection,

for it changes color at the point where all carbonate is neutralized, and where phosphate is present as primary phosphate. Its use, therefore, corresponds to a fairly-well marked point. (E. W. B.)

MacLean, H.: "On Anomalous Reactions Obtained in Testing Urine for Sugar with Fehling's Solution." The Lancet, January 11, 1908, pp. 85–90.

Several new and important points regarding the nature and extent of cuprous oxide precipitation, in urine containing slight amounts of sugar when treated with Fehling's solution, are brought out in this most instructive paper.

Doctor MacLean seriously questions, and in fact seems to quite upset, the generally accepted theory of Doctor Pavy that the ammonia, either present in loose combination or evolved by the destruction of the nitrogenous constituents of urine by the alkali in Fehling's, is the inhibitory influence in cuprous oxide precipitation when sugar is present only in small amount. He believes that the real cause is the presence of kreatinin (a leucomain—$C_4H_7N_3O$) and bases his assertion on the fact that kreatinin is capable of holding in solution small amounts of cuprous oxide and so no evidence of precipitation is given under circumstances involving only traces of sugar. This, he maintains, is a wise provision, since by reason of this action the clinician is not misled by a precipitation which would otherwise take place as a result of the trace of sugar present in normal urine. Precipitation only occurs when sugar is present in such amount as will reduce the copper in quantity greater than that which the kreatinin present is capable of holding in solution,

Kreatinin has, however, according to Doctor MacLean, and substantiated by Doctor Pavy, another very remarkable property, that of effecting the physical nature of the precipitate, and thus the various different colored solutions and precipitates often met with in this test are explained. When the quantity of sugar in excess is small the effect of the kreatinin is to cause a precipitation of cuprous oxide in an exceedingly finely divided state, giving a dirty greenish opalescent appearance to the mixture. When sugar is present in larger and larger amount the particles of cuprous oxide become coarser and coarser, thus passing from the state just mentioned to that which gives the yellowish-red solution and finally the red precipitate. Of course any other reducing body, Doctor MacLean states, such as glycuronic acid, would act in the same way, but it is sugar that most often gives these modified reactions. A parallel case may be offered as illustration of the difference in color of a substance, dependent upon the fineness of the subdivision of its particles, in the well-known yellow and red oxides of mercury.

Doctor MacLean cites certain experiments, made by Doctor Pavy in an endeavor to prove the inhibitory influence of ammonia as op-

posed to the theory of Doctor MacLean, in the course of which Doctor Pavy heated his mixtures of urine and Fehling's in boiling salt solution instead of over the open flame, and it appears obtained results quite different from those of Doctor MacLean, who worked with the open flame. This peculiarity was observed by the reviewer some years ago, although water only was used instead of salt solution. While in search of a more satisfactory method for quantitive work with this reagent a scheme, similar in general principle to the Nesslerizing method used in water analysis, was adopted. Briefly described this test was made with six test tubes—five tubes containing similar amounts of properly diluted Fehling's solution of a known sugar equivalent, to which were added definitely increasing volumes of urine from tube I to tube V, and a sixth tube containing twice as much Fehling's and the same amount of urine as tube V to serve the purpose of a check. These were boiled for ten minutes in a water bath and it was found that the results obtained were excellent and invariably uniform, demonstrating quite clearly the superiority of this method over the open flame generally employed.

Stanley R. Benedict in the Bio-Chemical Journal, Vol. II, No. 9, August, 1907, raises a question regarding MacLean's theory of the influence of kreatinin on the physical form of the precipitate of cuprous oxide and he suggests that the older assumption, that the red precipitate is cuprous oxide while the greenish-yellow precipitates are hydrated forms of this substance, has not been entirely disproved; in fact this view seems to be supported by experiments in which the alkalinity of the copper solution was secured by the use of carbonate instead of hydroxide of potassium and the precipitates thus produced were more generally greenish-yellow than those obtained with the usual Fehling's solution: the explanation being that the dehydrating action of the potassium hydroxide produces the red cuprous oxide, whereas the carbonate seems to effect a precipitate of a hydrated form of this substance. (P. J. W.)

SURGERY.

By Surg. H. C. CURL and Passed Asst. Surg. H. W. SMITH, U. S. Navy.

REVIEW OF ADVANCES.

Brain.—Important and generally accepted improvements have been recently made in the diagnosis and the technique of treating brain lesions. For many of the advances made of late in this important and hitherto almost unknown field we are indebted to Dr. Harvey Cushing, whose name is becoming more and more closely associated with the great progress in this line of work. By making use of opportunities presenting themselves constantly during opera-

tions on the brain valuable data are being collected concerning the cerebral cortex, and it has much modified our former ideas on the subject. These ideas were mostly based on animal experiments and it is now found that they are in many particulars unreliable. The motor area is found to be more restricted than was formerly thought and its outlines are rapidly being mapped. The importance of early routine retinal examinations in brain injuries is becoming more generally accepted. It seems proven that very early stages of "choked disk" can be demonstrated, aiding materially in diagnosis, which broadens the utility of this sign beyond brain tumors and chronic lesions only. Lumbar puncture shows the presence of blood in the spinal fluid and aids in the diagnosis of doubtful basal fractures. Early operation is now considered, more than formerly, to be of advantage in not only controlling immediate conditions, but in preventing the frequently found late results of cranial fracture, such as epilepsy, etc. "Decompression" operations, by the split-muscle method, over the middle meningeal vessels, are more frequently done and with better success. Occipital decompression is not advocated. Late operations for epilepsy are done less often than formerly, as the results seem not to justify any interference in these old cases.

Lungs.—Dr. Samuel Robinson's recent work on the lungs of dogs by the positive pressure apparatus bids fair to open a heretofore undeveloped field of surgery. If but a part of his hopes are realized, it will be within the power of the surgeon to open the chest, deal successfully with many diseases of the lung, and close the wound, without the very serious consequences now attendant upon such work. A practically untried field is being opened up in the treatment of apical tuberculosis by resection of enough abnormally rigid chest wall to allow mobilization and better expansion.

Thyroid.—The removal of parts of the thyroid in exophthalmic goitre and the progress made in knowledge of the parathyroids, the identification of parathyroidapriva and its relations to operative procedures must be classed as permanent and valuable advances.

Nerves.—Nerve disassociation is offered as a substitute for nerve stretching. It consists of freeing the nerve, lifting it up, and after the sheath is opened, separating or "disassociating" the fibers; the nerve is then covered, if possible, with adipose tissue to prevent cicatrization. Alcoholic injection for neuralgia is thought to be of marked benefit; some remarkable statistics are given.

Bladder.—Due to the frequency of recurrence in cases of bladder growths, both malignant and benign, there is a growing inclination to consider the abdominal (intraperitoneal) route as better than others. This is because of the much better exposure obtained and the possibility of using knife and cautery thoroughly. As a rule, complete bladder closure is done with catheterization, if needed.

Blood vessels.—The principles of the "Matas" aneurism operation are being used in some cases of traumatic false aneurism. Where there is a punctured or other small wound which communicates with the cavity formed by laminated blood, it can be sutured and the sac removed. In more extensive injury it is sometimes possible to do a partial or complete anastomosis with functionally good results.

Pancreas.—Much better results are now being secured in work on the pancreas than formerly. This is due to (1) more accurate diagnosis of its diseases, (2) earlier operation, (3) a better knowledge of the methods of reaching the organ, and (4) greater knowledge of suture methods and drainage.

Transplantations.—Carrel's very interesting experiments on the transplantation of organs seem to open marvelous possibilities for the future. While his work has not reached a point where it can be advised for use on human beings, yet it has shown what can be done with improved technique. The fact that both kidneys, together with the ureters, the renal arteries and a section of the aorta and cava were transplanted and functionated for several weeks, is in itself worthy of consideration.

ABSTRACTS.

MUSSER, J. H. The medical and the surgical treatment of gastric ulcer. Am. Journ. Med. Sciences, December, 1907.

Doctor Musser considers that most of the cases of gastric ulcer should be treated medically and only recommends surgical interference in (*a*) cases of perforations (always); (*b*) obstruction, dilatation, hour-glass contraction, adhesions; (*c*) recurrent hemorrhage; (*d*) failure of medical treatment. He considers that operative treatment does not mean the discontinuance of medical treatment and that such should be kept up for a long time after the operation. Gastro-enterostomy is the operation recommended as a rule and attention is called to the great difference, statistically, in the results of experienced and inexperienced operators. The author evidently considers surgical interference as only of limited use and then merely as an adjunct to the medical treatment.

ROBINSON, S. Experimental surgery of the lungs. Annals of Surgery, February, 1908.

A series of experiments performed at the Harvard Medical School Research Laboratories has resulted in the development of an extremely satisfactory *positive-pressure* apparatus, by the aid of which many extensive operations on the lungs of dogs were performed. Doctor Robinson's experiments seem to prove the advantage of the positive-pressure mask, without tracheotomy, over the large, expensive, and cumbersome negative-pressure cabinet as devised

by Sauerbuch. The contention that any positive-pressure apparatus would cause (1) permanent congestions, (2) interstitial emphysemas, (3) difficulty in preventing a persistence of the pneumothorax after operation, and (4) difficulty of narcosis, was shown to be without foundation. Very extensive operations, even to the removal of two lobes of the right lung, were successively carried out. This certainly opens a valuable field in surgery, and the removal of a tubercular apex may be expected as a possibility of the future.

MORRIS, R. T. Another diagnostic point on McBurney's line. Journ. Am. Med. Ass. January 25, 1908.

Pressure made at a point 1½ inches from the navel on McBurney's line is considered as being of definite value in diagnosis. Pressure made here has reference to the right lumbar ganglion of the sympathetic and pressure at this point aids in differentiating appendicitis from pelvic trouble. Briefly, a patient comes in with appendix "in the form of a question mark." Right lumbar ganglion tender, *alone:* Appendix trouble. Right and left lumbar ganglion tender *together:* Pelvic trouble. Neither right nor left lumbar ganglion tender: Trouble somewhere cephalad from pelvis and appendix.

CHAPUT. Appendicectomy by a transverse incision. Bulletin et Mem. de la Soc. de Chir. de Paris. January 1, 1907.

The writer calls attention to a new form of external incision. It is acknowledged as a variant of McBurney's. It starts from the anterio-superior spine and is carried horizontally inward to the outer margin of the rectus, or nearer the mediàn line. At this level the fibers of the internal oblique and transversalis are absolutely horizontal and the incision need not be as long as McBurney's. No nerves are severed. The incision is said to give more room and is more easily extended.

WRIGHT, A. E. Orthostatic albuminuria. Lancet, October 21, 1905.
JEHLE. Münch. Med. Wochenschrift, January 7, 1908.

All are agreed that albuminuria does not necessarily indicate disease of the kidneys, either functional or anatomic, and heretofore the responsibility of judging the soundness of these organs has been assumed only by the surgeon who is obliged to decide promptly and who can call to his aid the various methods of functional exploration. Wright, after a study of these cases of albuminuria in relation to life insurance, considers that the phenomenon is due to chemical changes in the blood serum, and that when the excretory quotient $\frac{\text{Mol. concentration of urine}}{\text{Mol. concentration of blood}}$ is normal, and when certain postures

together with the administration of calcium salts, control the excretion of albumin, the albuminuria is not more prejudicial to the continued health of an individual than is a simple urticaria. Jehle finds an anatomical cause present which has not previously been observed. In seven children the condition of the vertebral column was concerned in the excretion of albumin. His observations were: (*a*) If lordosis was prevented by the application of a straight jacket, the erect posture was not accompanied by albuminuria; (*b*) if forward bending was maintained, the erect posture was not accompanied by albuminuria; (*c*) if lordosis was maintained by a jacket, albuminuria continued without regard to posture. These cases showed an abnormally pronounced lordosis at the level of the first and second lumbar vertibræ, due, apparently, to deficient musculature.

LEJAIS. Surgical treatment of emphysema. La Lemaine Medicale, No. 45, 1907.

Lejais suggests the possibility of relieving otherwise incurable emphysema along lines laid down by Freund in 1858. Freund believed that some cases originated in disease of the costal cartilages, the cartilages being thickened, deformed, rigid, and, on section, yellow and riddled with cavities. Three cases of excision of the second and third costal cartilages are reported from various clinics; there were no ill effects, and relief of symptoms followed. In one case the vital capacity of the thorax was increased from 800 to 1,400 c. c. Suitable cases are probably those in which the thorax is fixed and barrel shaped and in which fluoroscopy shows irregular thickenings of the cartilages. If operative measures are to be successful, they should be undertaken before the heart or lungs have suffered grave organic changes.

CUSHING, H. Certain cranial operations. Journ. Surgery, Gynæcology, and Obstetrics, March, 1908.

Doctor Cushing recommends the following technique in head operations: (1) The ordinary cleaning with soap and water; (2) shaving the entire head just before the operation; (3) anesthetic; (4) scrubbing up on the table; (5) outlining the flap with the knife lightly; (6) cover entire scalp with gauze wrung out of bichloride solution; (7) application of tourniquet band as low as possible; (8) removal of a flap of the gauze (either before or with the first incision); (9) operation.

For purposes of cerebral localization he employs an electric cell, one pole being represented by an 18-inch glass tube with a rubber tube inside, which carries a platinum wire, terminating in a spiral, almost to the point. The other pole is attached to a plate strapped to the leg or arm. Care is used to prevent too strong a current and moderate anesthesia is advised.

McWilliams, C. Diseases of the liver amenable to surgical treatment. N. Y. Med. Journ. December 7, 1907.

Referring to operations for cirrhosis, *early* interference is considered as contributing *most* toward success; the condition of the blood vessels and the kidneys should be carefully examined and prognosis further based upon it. Cholecystostomy is indicated in hypertrophic varities accompanied by icterus. Thirty to 40 per cent of cases of cirrhosis are relieved by surgical measures, and more cases would be cured if they were referred to the surgeon early.

Namba, N. Bullet wounds of nerves and their plastic operations. Sei-i-Kwai, December, 1907.

This article analyzes 439 nerve lesions occurring in some 6,663 cases of injuries to the extremities treated at the Nagoya Army Hospital. The increased proportion of nerve injuries is explained as due to the increased velocity of projectiles and to the fact that many legs and arms are now saved, that, under old conditions, were amputated. The nerves of the forearms are those most often involved as a result of their more exposed position. Of the total cases treated, some by medical and some by surgical methods, 24 per cent were considered cured. The author states, however, that many of the cases cured were of a very mild nature. No rule of procedure could be laid down; the technique was decided upon as indicated in each case and included simple massage and baths, electricity, freeing from the pressure of surrounding tissues, resection, transplantation, and implantation.

Glagolieff, M. I. Rifle bullet, shrapnel, and shell wounds in the Russo-Japanese War. (Review of original paper read before a Russian medical society.) The Lancet, November 9, 1907.

Among the statistics of special interest is the statement that 25 per cent of the wounds treated were made by shrapnel. This is a much larger percentage than was anticipated before the war and is a great increase over the 4 per cent of the Russo-Turkish war. As shrapnel wounds are usually more severe than small arm wounds, this notable increase in their proportion is of much practical importance as indicating at least the need of larger preparation for their proper treatment. Many more cases of suppuration occurred among them; there were more penetrating wounds with lodgment of projectile; and a longer time was required for convalescence. Glagolieff agrees fully with the modern teaching of simply applying a first-aid bandage in the field, reserving almost all operative work for a later time when surroundings are satisfactory.

OCHSNER. Gastric surgery. Interstate Med. Journ., December, 1907.

Doctor Ochsner believes in trying careful medical, hygienic, and dietetic measures before operating. If operation is indicated, observe the following rules; (1) The amount of traumatism must be reduced to a minimum; (2) the intra-abdominal organs must be exposed as little as possible to cold air or cool pads; (3) the patient must be placed in a sitting posture as soon as possible after the operation; (4) in case of closure of perforation, the direction of the wound must be chosen with a view to avoiding obstruction later on as a result of cicatricial contraction; (5) in case of excision of a neoplasm, all the tissue closely connected must be removed with the growth to the greatest extent possible in the presence of existing anatomical relations; (6) in gastro-enterostomy the lowest portion of the stomach must be chosen, *no matter whether anterior or posterior gastro-enterostomy be performed, the latter, however, being preferable;* (7) there must be *no* tension upon *any* sutures in *any* gastric operation; (8) except in complete gastrectomy, the coronary artery must always be preserved; (9) in patients with an unusually fat transverse meso-colon, in whom posterior gastro-enterostomy is performed, the opening should be torn very large, and the edge should be sutured to the stomach in order to prevent obstruction; (10) in case of acute gastric dilatation, following any stomach operation, a stomach tube should at once be introduced and gastric lavage employed, care being taken not to introduce more than one-fourth liter of water at a time; (11) the simplest possible technique should be employed, preferably without the use of mechanical apparatus.

NOEHREN, A. H. The value of differential leucocyte count in appendicitis. Annals of Surgery, February, 1908.

CONCLUSIONS.

(1) Blood examination in cases of acute appendicitis is of great value in determining the severity of the condition and therefore deciding whether or not immediate operative interference is indicated.

(2) The degree of leucocytosis, formerly considered an important diagnostic aid, is too variable to be of any practical value.

(3) The relative disproportion between the percentage of polynuclears and the degree of leucocytosis is reliable in a majority of cases, but the number of exceptions is so great that its practical value in determining immediate operation becomes very small.

(4) The estimation of percentage of polynuclears alone is more reliable than either of the preceding methods and therefore, together with the fact that it is the one most easily made, the method to be recommended.

(5) A polynuclear percentage of 90 or more indicates a severe process that needs immediate operative interference; a percentage below 78 means a "safe" or mild process; a percentage between the two extremes speaks for the one condition or the other according as it approaches the one extreme or the other.

PATHOLOGY AND BACTERIOLOGY.

By Passed Asst. Surgs. C. S. Butler and O. J. Mink, U. S. Navy.

Robert Muir, M. D., University of Glasgow. On proliferation of the cells of the liver. Journal of Pathology and Bacteriology, January, 1908.

Excluding new growths, proliferation in the liver in common with other tissue, is met with under two chief conditions, namely, (*a*) in repair following breach of continuity of structure, and (*b*) in compensatory hypertrophy and hyperplasia. The distinctions between these two conditions is an important one both as regards the mechanism by which the proliferation is brought about and as regards the structural changes which follow.

In summarizing his work under (*a*) the author states that in the breach of continuity following trauma and destruction of liver cells alike, extensive epithelial proliferation is to be found. In the former case it is chiefly on the part of the liver cells, owing to the multiple rupture of the columns. On the other hand, following the destructive lesions in acute yellow atrophy and allied conditions, the proliferation is chiefly on the part of the bile duct epithelium. This grows into the lobules in the spaces formerly occupied by the liver cell columns, and may come to effect continuity with cells which have escaped the destructive process. A certain amount of transformation of bile duct epithelium into young liver cells may be observed, but little effective regeneration of the liver tissue is brought about in this way, owing to the concomitant growth of connective tissue which afterwards undergoes contraction. The bile duct structures may be found in broad areas of connective tissue for a long time afterward and apparently they undergo little change. A certain amount of proliferation in surviving liver cells may be met with, and they may also produce duct-like offshoots; compensatory hypertrophy occurs in the larger areas.

(*b*) When a large portion of liver tissue is lost, the chief restoration of liver tissue is accomplished by compensatory hypertrophy and hyperplasia. The proliferation occurs principally at the periphery of the lobules, and the young cells are distinguished by their larger size and clearer protoplasm. The liver columns become broader than normal and many of the cells are large and contain more than one nucleus. The restoration of tissue accordingly

occurs by an enlargement of the surviving lobules, the diameter of these becoming much increased.

In considering six cases of adeno-carcinoma, combined with cirrhosis, the author draws the following conclusions:

(1) In all of them the cirrhosis, which is uniformly distributed in the liver, has preceded the origin of cancer.

(2) The origin of the growth in all cases is from the liver cells.

(3) The cancer takes origin in multiple independent foci.

In one case of simple adenoma he explains the origin by supposing that a distal portion of the epithelial outgrowths which form the liver had become cut off and had grown independently to form the tumor in question. The displaced cells were evidently representative of liver cells, already differentiated, since no bile duct epithelium was present. (O. J. M.)

FLEXNER, SIMON, and JOBLING, J. W. Serum treatment of epidemic cerebro-spinal meningitis. Journal of Experimental Medicine, Vol. X, No. 1.

The authors describe a serum used in the treatment of cerebro-spinal meningitis, which in the several epidemics in which it has been tried seems to markedly lower the mortality in this usually very fatal disease. This paper details the results of treatment by the serum in epidemics occurring in Akron, Cleveland, and Castalia, Ohio, and at Philadelphia and New York, and also an epidemic in Edinburgh, Scotland, and in Belfast, Ireland. A paper dealing with the Scotch and Irish epidemics has also appeared in the British Medical Journal for February 15, 1908, by A. Gardner Robb. Seven of the cases considered in Robb's paper are also included in Flexner and Jobling's statistics, but it would appear that the lowering of the mortality by the serum treatment is practically the same for the British and American epidemics. The mortality among cases not using the serum was approximately 73 per cent, and among those using the serum about 25 per cent. In practically all the cases the diagnosis was verified bacteriologically. The authors considered the possibility of lessened epidemic virulence among the treated cases and showed that the cases treated were of the average intensity of virulence of epidemic cerebro-spinal meningitis. Robb's statistics on this point are very significant.

1. In the first eight months of the English epidemic (to August, 1907) 275 cases were treated without the use of serum and 199 died, a mortality of 72 per cent.

2. Cases treated at their homes without antiserum, September 1 to December 31, 1907, 34, with 29 deaths, mortality 85.2 per cent.

3. Cases treated in hospital with serum September 1 to December 31, 1907, 30, with 8 deaths, mortality 25.6 per cent.

The method of preparing the serum used by Flexner and Jobling consists in inoculating the horse with cultures of the diplococcus, of which many strains were used. The injections were given hypodermically in gradually increasing amounts. Later intravenous inoculations were used; then subcutaneous and intravenous injections of an autolysate. The intravenous injections were discontinued and at the present time subcutaneous injections of the living diplococci and of the autolysate are alternately given at seven-day intervals, many different strains of the diplococcus being used in the preparation of the living cultures and the autolysate. The horse from which the antiserum came was in process of immunisation for a year or more.

The antiserum is administered by lumbar puncture after withdrawal of an approximately equal quantity of cerebro-spinal fluid. It should be kept on ice until ready for use and then warmed to the body temperature. It should not be used in quantities greater than 30 c. c. The antiserum should be used as early in the course of the disease as possible, and always when the withdrawn cerebro-spinal fluid shows gram negative diplococci inside and outside the pus cells. If the disease proves later to be other than cerebro-spinal meningitis, no harm will have been done by the injection of antiserum. The injections should be repeated every twenty-four hours for three or four days. As much as 120 c. c. of antiserum has been injected into the spinal canal in four days without unpleasant symptoms. Injections should be made under chloroform anaesthesia (Robb). In the later stages of the disease, unless chronic hydrocephalus has already developed, it is expedient to use the antiserum. There is evidence that the antiserum acts by neutralizing the toxin, by bacteriolysis, and by rendering the diplococci more phagocytable. There has been no observation so far which gives reason to fear the development of hypersusceptibility in case the injections are given with long intervals between. The Rockefeller Institute will be able to supply a moderate amount of the antimeningitis serum for use under conditions which the authors (Flexner and Jobling) shall prescribe. (C. S. B.)

MEDICAL ZOOLOGY.

By Surg. R. C. Holcomb, U. S. Navy.

Anderson, R. Parasitic infections of the bowels. Journal of the American Medical Association, December 14, 1907.

This article is of interest as showing the American distribution of the parasites dealt with. The author reports one case of ankylostomiasis in a resident of Utah, who probably acquired the infection in the vicinity of Montgomery, Ala. He also reports 3 cases in

which he found *trichomonas intestinalis* and 11 cases in which he encountered amœbæ. These infections of the *trichomonas* and *amœba* he states are autochthonous in Utah.

YOUNT, C. E., and SUPLER, M. T. Human myiosis from the screw-worm fly (*Compsomyia marsellaria.*—Fab.). Journal of the American Medical Association, December 7, 1907. p. 1912.

These authors report 23 cases of myiosis contracted in Arizona, and cite cases occurring in Louisiana, Mississippi, Texas, and Kansas. All except 5 of their cases were of the nasal form of myiosis; of these 4 were fatal.

According to these authors the first symptoms of the nasal form appear within twenty-four hours. They quote Francis as stating that the eggs of the fly will hatch out within one hour when laid in a moist place on a warm day. The first symptom is a discomfort in the nose which, gradually increasing, amounts to a severe pain usually located over the frontal sinuses. From here it may radiate toward either temple or deep in the superior maxillæ. There is usually fever, but this seldom rises above 102° F. In severe cases delirium may develop. A foul smelling bloody discharge is always present. The discharge does not contain larvæ until the last stages of the disease when they are full grown and seek the earth to undergo the next stage of their transformation into the mature insect. The tissue attacked becomes very much inflamed and necrotic. The maggots may completely destroy the soft part, so that the bone is denuded and undergoes necrosis.

As regards treatment, the best result, according to these writers, is obtained by first spraying with chloroform, to kill the maggots, and then with potassium permanganate (1 to 4,000), as often as necessary to keep the nasal passages clean.

MACKIE, F. P. Part played by *Pediculus corporis* in the transmission of relapsing fever. British Medical Journal, December 14, 1907.

Capt. F. P. Mackie, I. M. S., in his further work with the relapsing fever of Bombay, reports an epidemic of the fever in a mixed settlement of boys and girls in which the body louse (*Pediculus corporis*), seemed to be a factor in its spread.

The disease appeared among the boys in a high percentage, while among the girls there was at first a proportionately small number of cases. The boys, it was found, were quite generally infected with the body louse, while among the girls the parasite was almost absent. Later, as the epidemic spread among the girls, there was a notable increase in the body louse among them.

The body lice taken from the boys' ward were found to contain living and multiplying spirochætæ. The chief seat of this multiplication was the louse's stomach, and this continued in spite of active digestion carried to the disappearance of all other cellular elements. In Mackie's work with the bedbug (*Cimex lectularius*) the spirochætæ were found only in the presence of fresh blood. (See Review, p. 57, vol. 2, United States Naval Medical Bulletin.) Carrying the investigation further, Mackie found that the secretion from the mouth of the infected louse contained numbers of active spirochætæ. An attempt to infect a monkey by means of infected lice failed, although in a previous experiment with 6 monkeys, using the *Cimex lectularius*, one of the animals contracted the disease after being exposed to the bite of 30 bedbugs fed on blood containing spirochætæ.

Mackie considers that the above facts throw suspicion on the body louse as a possible factor in the spread of this disease, and that further experiments with monkeys are, therefore, warranted in studying the rôle of the *Pediculus corporis* in relation to this disease.

The author found that, as the disease subsided among the boys, the percentage of infected bugs fell. He points out that relapsing fever as it occurs in Bombay is a disease of the poorer classes who live under wretched conditions of overcrowding, with its attending filth and probable lousiness.

The present knowledge of the parasites causing relapsing fever is still in an imperfect state. That the European, American, African, and Indian parasites appear to differ from each other in certain pathological characteristics is well known. The European variety, or *S. recurrentis*, as pointed out by Koch, has a longer febrile stage than the African species, in which the fever usually lasts under three days. He also noted that the spirochætæ are proportionately less numerous in the blood with the African infection. Manson has called attention to the fact that while the European variety has but two or three relapses, the African variety may have as many as eight or nine. Novy and Knapp, in comparing these two spirochætæ, noted that their African species, for which they propose the name *S. duttoni*, were 16 microns, or twice as long as the *S. recurrentis*. These authors also noted that the Indian species like the *S. recurrentis* are shorter than the African species. Todd and Breinl have shown that the immunity conferred by infection with the Indian spirochætæ does not confer immunity against the infection of the *S. duttoni* and *vice versa*. By these same immunity experiments Fraenkel has shown that the African infection does not produce an immunity against the American infection. Mackie has suggested the provisional name *S. carteri* for the Indian species as a tribute to the memory of Van Dyke Carter, whose monograph on the fever is still a monument to the carefulness

of his observation. Mackie, working with Novy's antispirochætæ serum of a highly immunized rat, found that it had no effect whatever on the *S. carteri*. The work of Dutton, Todd, and others has shown that the African species, *S. duttoni*, may be carried by the tick, *Ornithodorus moubata*. Both the insect, after it has fed on an infected individual, and its progeny may transmit the disease. This is probably the result of infection of the genital organs of the female by the male tick, who inserts his rostrum with its mouth organs into the genital orifice of the female during coition, or it may be, as suggested by Manson, due to the taking up of spirochætæ by certain cells in the stomach wall of the tick, where they split and discharge their nutriment into the general body cavity of the tick. Here the spirochætæ mix with the blood of the tick, the parasite being thus enabled to reach other organs, including the ovarium, which lies upon a diverticulum of the alimentary canal in the posterior part of the body. Ricketts has found that the tick *Dermacentor occidentalis* will transmit the virus of Rocky Mountain fever to its larvæ, although it would appear that his ticks were impregnated before the infective feed. Mackie, in studying the infection of the *S. carteri* in the *P. corporis*, found that while the ovarium was frequently infected, no spirochætæ were found in the eggs.

Low, G. C. The Unequal Distribution of Filariasis in the Tropics. The Lancet (Lond.), February 1, 1908, p. 279.

The author reviews his experience in some of the West Indies, giving the number of individuals that he examined and the number in whom he found the *Microfilaria* of the *Filaria bancrofti*. His percentages ran as follows:

Location.	Cases examined.	Microfilaria found in.
		Per cent.
St. Kitts	143	32.8
British Guiana	150	16.6
Barbados	600	12.66
Trinidad	400	10.75
Dominica	144	7.63
St. Lucia	356	7.58
St. Vincent	100	6
Grenada	174	0
Carriacon	28	0

In reference to the *Microfilaria demarquayi* he found these embryos at St. Lucia, St. Vincent, Dominica, Trinidad, and possibly St. Kitts. An interesting feature of this observation was that the parasite seemed to be limited to one particular village of the islands. In St. Lucia, at a village called Gros Inlet, he found 25.8 per cent of 63 people examined harboring the *Microfilaria demarquayi*. Although he found the parasite in the blood of some 5 others out of a large number of people examined then living in several other towns of the island, all except one (who had previously lived at Nevis) had at some time lived at Gros Inlet. At St. Vincent in one town, Calleaqua by

name, he found 32 per cent of those he examined harboring the parasite. Although he examined the inhabitants of several other towns he found but two cases in other parts of the island, and these two individuals had formerly lived at Calleaqua.

Low invites attention to the fact that in dealing with the *Microfilaria demarquayi* we are not on certain ground so far as relates to the intermediary host. The adult female *filaria* and the *microfilaria* have been described, but the adult male *filaria* is still unknown. Since Wellman began his work on the rôle of the tick, *Ornithodorus moubata*, as the spreader of *Filaria perstans*, he has come to hold the opinion that a similar bug-like intermediary host may act correspondingly in relation to the *Microfilaria demarquayi*.

Writing of the *Filaria perstans*, the author shows that in parts of Africa, as Kavirondo at the east of Victoria Nyanza, this type of Filariasis was not found; that at the Sese Island, in the northwest corner of the lake, 86 per cent of the natives examined showed evidences of the infection; while at Ankole, west of the lake, only 7.8 per cent of the natives examined showed evidence of the infection. He refers to the work of Wellman, who has recently furnished strong evidence tending to show that the *Microfilaria* of this parasite can undergo a metamorphosis in the tick, *Ornithodorus moubata*, and points out that, though the distribution of the *Filaria perstans* and this tick coincide in most instances, it is not true of British Central Africa, where, though the tick is common, the blood parasite, according to Daniels, yet remains to be found.

TROPICAL MEDICINE.

By E. R. Stitt, U. S. Navy.

Browning. Chemo-therapy in trypanosome infection. Journal of Pathology and Bacteriology, January, 1908; British Medical Journal, November 16, 1907.

In these articles Browning details the experiments conducted by him in Ehrlich's laboratory in connection with treatment of trypanosome infected animals with various chemo-therapeutic agents. He shows that the effective compounds, at present known, belong to three distinct chemical groups: (1) Dyes derivative of benzadin; (2) basic triphenyl-methane dyes, and (3) arsenical compounds, especially atoxyl and acetyl-atoxyl. Of the first group he records experiments with trypan-red and trypan-blue, the latter being more effective, producing complete cures in a number of instances. The leading member of the second group is parafuchsin. Experiments in feeding mice with this drug for a week prior to inoculation with trypanosomes and continuing it an equal length of time subsequently conferred immunity upon 10 out of 11 mice so treated. Of the arsenical compounds he shows that acetyl-atoxyl, which contains 5 per cent more

arsenic than atoxyl (29 per cent), is ten times less toxic for mice. A very important point in the paper is the experimental work in connection with the production of chemo-resistant strains of trypanosomes. Where the institution of treatment was too long delayed or was not sufficiently active, these trypanosomes developed an immunity to the agent employed, which property they retained in succeeding generations when inoculated into other mice (after 140 passages through mice in a period of fourteen months).

Trypanosomes which were chemo-resistant to atoxyl, however, did not resist parafuchsin or trypan-blue. He makes the interesting statement that he has produced a strain of trypanosomes resistant to all three classes of trypanocidal agents, viz: Atoxyl, trypan-blue, and parafuchsin. He also brings out the superiority of combined treatment over a single therapy. Thus, by a combined treatment of acetyl-atoxyl and trypan-blue, he obtained gratifying success.

The above article is of great practical importance, not only in connection with trypanosomiasis, but also is suggestive as regards successful treatment of syphilis and malaria. It points out the importance of early and vigorous treatment as necessary to prevent possible establishment of resistance to the therapeutic agent. It is also suggestive as to changing to another remedy should chemo-resistance be established and likewise to the advantages of combined treatment.

Koch, Prof. R. Final report of the German expedition for the investigation of sleeping sickness. Deutsche Medizinische Wochenschrift, No. 36, 1907.

It is stated that in one of the districts studied there were no tsetse flies. It was thought, however, that the cases there present were contracted by the young men who went to Uganda owing to better opportunities for work. These men became infected there and returned to their own country when sick. In this connection it is to be noted that Koch thinks the tsetse fly the only biting species concerned in the transmission of the disease. The fact was noted, however, that 15 females, the wives of the men above referred to, had become infected. Inasmuch as the only infected persons who had not been out of this district and who contracted the disease were wives of men having trypanosomiasis, Koch believes that the disease may be transmitted by sexual intercourse. This is the manner of contagion in dourine, a trypanosome disease of horses in Spain.

In the way of prophylaxis Koch recommends:

1. Isolation camps where early cases (those showing the glandular enlargements) can be treated from four to six months.

2. Clearing of the growth along banks of streams.

3. Destruction of crocodile eggs, so as to destroy the source of food supply of *Glossina palpalis*—the blood of the crocodile.

In an editorial in the Journal of Tropical Medicine and Hygiene, the fact is brought out that such measures are impracticable. In the first place land quarantines have not proven feasible even in civilized Europe, so that one lasting months or even years would certainly be impracticable in an uncivilized country. (Koch recommends that suspects be held two years.) Again, it is pointed out that owing to the great reproductive capacity of the crocodile and the inaccessibility of their haunts, measures of this kind would not offer great promise. Attention is called to the sinister import that trypanosomiasis may be contracted by sexual contact. The possibility of its spreading as does syphilis adds to the importance of the disease in other than its areas of geographical distribution.

EYRE. Critical review of recent work on Mediterranean fever. Quarterly Journal of Medicine, January, 1908.

This writer states that the disease is a specific septicæmia resulting from infection with *M. melitensis*.

In considering the investigations made by the Mediterranean Fever Commission, it is noted that the work was carried on in two directions—the one, bacteriological and experimental, the other, epidemiological. The organism was isolated from the peripheral blood of patients from the second to the three-hundredth day of the disease. The micrococcus was also demonstrated in the fæces of one fatal case in man. In investigating the disease in natives of the island, Shaw showed that an ambulatory form of the disease existed which was devoid of symptoms. In experimenting with monkeys it was shown that infection did not take place by unbroken skin, but that if infected urine from an ambulatory case was applied to the normal mucous membrane of the glans penis of the monkey infection resulted. Moreover, as over 30 per cent of the prostitutes of Malta gave evidence of melitensis infection it afforded strong probability that Malta fever might be conveyed by sexual congress.

In connection with infection of the Maltese goats, one-half of 1,500 animals showed agglutinins in their serum. Experiments with monkeys showed that of 28 fed with infected milk 26 became infected. The strongest proof rests with the case of the steamship *Joshua Nicholson*. The ship in question carried 60 milch goats from Malta to Antwerp. Of 10 of the crew who drank this milk on the voyage 8 became infected.

As very striking confirmatory evidence, it is noted that, following the agitation about goat's milk, the venders went "on strike" and canned milk was substituted, which resulted in a remarkable decline of Malta fever cases.

BASSETT-SMITH, P. W., fleet surgeon, R. N. Recent work on cause, prevention, and treatment of Mediterranean fever. Journal of the R. A. M. C., January, 1908.

In connection with the work of the commission for the investigation of Malta fever, Bassett-Smith states that after three years of thorough investigation of the disease by laboratory and epidemiological methods definite conclusions as to source of infection and methods of prevention have been reached. He states, also, that since August 4, 1906, when boiling of all fresh milk for the hospital and fleet was instituted, there has been almost a cessation of the disease. In 1905 there were 798 cases reported among civilians and 245 naval cases. In 1907 there were 457 cases among civilians and only 12 cases in the naval forces. In further pursuit of the import of such observations, the following conclusive proofs as to the milk-infection theory are brought forth:

1. The practical disappearance of the disease from Gibraltar following the removal of infected goats.

2. The absence of the disease in the civil prison at Malta where milk is not allowed.

3. The great reduction (90 per cent) in admissions among the military since the milk has been boiled.

4. The continued presence of the disease in the civil population who are not under control—1905 gave 798 cases, 1906 gave 724 cases, and 1907, 457 cases.

As regards prophylactic treatment with vaccines a considerable degree of immunity appeared to be conferred on two monkeys given three injections of a killed culture of *M. melitensis*. The experiments in connection with man have, however, been inconclusive.

As regards treatment he considers antisera as unsatisfactory in results. Vaccines are of no value in acute stages of the disease, but give favorable results in the chronic manifestations of the disease. Drugs he considers of little value, quinine being useless and harmful.

DEANE, GEO., Lister Institute. Specific prophylaxis and treatment of bacterial dysentery. Journal of the R. A. M. C., December, 1907.

In the first part of this article Deane briefly reviews the leading points in connection with bacillary dysentery, noting that nothing of a convincing nature was known until Shiga isolated a causative organism in a number of cases of dysentery in an epidemic in Japan which claimed 22,300 victims out of 89,000 cases.

He states that Shiga tried injecting vaccines killed at 60° C., giving about one-half the growth of an agar tube. He found the reaction much more severe than from cholera or typhoid inoculation. He afterwards combined immune serum with his killed vaccine. As a

result he found that mortality among those so inoculated was almost nil, while 30 to 40 per cent of the noninoculated died.

The incidence of the disease (morbidity) was unaffected, however. Shiga believes more in serum prophylaxis than in use of bacterial vaccines.

By the use of his serum Shiga reduced the mortality from 22 per cent to 7 per cent. Kruse, in Germany, reduced the mortality from 11 per cent to 5 per cent. Both Shiga and Kruse consider the action antibactericidal.

The workers at the Lister Institute have succeeded in obtaining a soluble toxin from Shiga's bacillus, and the serum obtained by immunizing with this soluble toxin possessed antitoxic power.

By growing Shiga's bacillus for one month on alkaline broth they could, by injecting this bouillon culture into rabbits, cause congestion, hemorrhages, etc., of the large gut. They found that the Flexner-Strong bacillus had practically no soluble toxin.

Todd thinks the toxin of intracellular origin. At this point Deane calls attention to the fact that our views as to a sharp line between intracellular and extracellular toxins are scarcely tenable.

Todd found that 0.001 c. c. of his serum would protect rabbits against 20 minimal lethal doses of toxin. This would make it comparable with diphtheria, tetanus, and botulism antitoxins.

Rosenthal treated 157 cases with this serum and reduced the mortality from 11 per cent to 4 per cent. The results from the use of Rosenthal's serum by the Russians were excellent. Kraus, who used it in the Russian army, reported that it controlled pain and tenesmus as would a narcotic—the stools rapidly assuming normal condition, and that the period of illness was shortened. It would therefore seem to be of value as a prophylactic and curative agent.

RUGE, Prof. Dr. REINHOLD, Marine-Generaloberarzt, and Doctor ESAU. The transmigration of dysenteric amœbæ through the intestinal walls. Centralblatt f. Bakteriologie, Parasiten Kunde, etc., Bd. XLVI, 1908. Heft 2.

The authors publish two colored plates with seven figures, showing to perfection the passage of dysenteric amœbæ through the walls of the intestine. The material from which the sections were obtained came from the intestines of a young cat; fixation was done by sublimate alcohol and staining with hæmatoxylineosin. The cat had been infected per anum with a strain of amœbæ obtained from China. Death had occurred at the end of six weeks from general exhaustion.

Figure 1 shows a cluster of nine amœbæ in the submucosa; figure 2 shows a large number of them making their way into the muscularis; figure 3 shows amœbæ in a tissue space between the circular

and longitudinal layers of muscular fibers; figure 4 shows the same amœbæ in the serous layer; figure 6 shows the same very much enlarged, and figure 7 shows a generalized infection of an adult cat's intestine, infected by the mouth, with a strain of dysenteric amœbæ obtained from New Guinea; infection very intense, death occurring at end of three weeks. An abscess is noticed in the submucosa and clusters of amœbæ are seen in its walls.

These figures not only substantiate the fact that these amœbæ are the cause of dysentery but also present strong proof that they penetrate the intestinal walls.—*Medical Inspector, H. G. Beyer.*

GENERAL MEDICINE.

By Surgs. R. M. KENNEDY and F. L. PLEADWELL, U S. Navy.

REVIEW OF ADVANCES.

DIAGNOSTIC.[a]

Pirquet's cutaneous tuberculin reaction.—Pirquet dilutes Koch's old tuberculin four times, places a few drops on the skin of the arm, and then scarifies superficially through the tuberculin as is done in ordinary vaccination. If the individual is or has been tuberculous, a small papule appears within a day or two, at first bright red, then darker in color, disappearing in seven or eight days. There is no general reaction and no pain. The reaction is regarded as probably an antibody phenomenon.

He found that nearly all tuberculous children reacted positively, the exception being cases of miliary tuberculosis, tuberculous meningitis in the terminal stage, and extreme cachexia. In adults the method was found less valuable, decreasing in significance with the age of the patient. While the final decision as to the value of the test must be left to the future, the following conclusions seem fairly well justified. Pirquet's test is a trustworthy indication of the presence or absence of tuberculosis in children more than 2 years of age; in adults a negative test speaks strongly against the presence of tuberculosis, a positive reaction having much less diagnostic value.

Conjunctival tuberculin reaction.—(The methods of Wolff-Eisner and Calmette.) During the discussion following Pirquet's demonstration of his method in the Berlin Medical Society, Wolff-Eisner announced a modification of the test, consisting in the instillation of one drop of a 10 per cent solution of tuberculin into the conjunctival sac. In case of tuberculosis a more or less severe conjunctivitis, rarely accompanied by a very mild general reaction, was said to result.

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[a] Taussig. Some recent diagnostic methods. Interstate Medical Journal, January, 1908. pp. 19-26.

About a month later Calmette reported the results of independent work along the same lines. In order to avoid the irritating effect of the glycerine present in tuberculin upon the conjunctiva, he precipitates the active principles of tuberculin with 95 per cent of alcohol and redissolves the precipitate in 100 parts of sterile water. One drop of this solution is instilled into one eye of the person to be tested. Within from three to five hours the individual, if tuberculous, will have a marked congestion of the palpebral conjunctiva, which becomes red and œdematous. The lacrymal caruncle is also swollen, red, and covered with a slight fibrinous exudate. The inflammatory reaction continues, and at the end of about six hours the fibrinous secretion has increased so as to form a number of threads in the conjunctival cul-de-sac and at the internal canthus of the eye. The reaction reaches its maximum in from ten to sixteen hours. There is no pain, but the patient complains of a slight burning and of a blurring of vision due to the abundant exudate. All signs of the reaction have disappeared usually by the end of eighteen to twenty-four hours. In the nontuberculous there is no reaction whatever, or at most a slight redness, which rapidly disappears and is unaccompanied by lacrymation or a fibrinous exudate.

It soon appeared that a 10 per cent solution of tuberculin as suggested by Wolff-Eisner was often productive of an excessive local reaction, and later observers have nearly uniformly used a 1 per cent solution either glycerine free, following Calmette, or a mere dilution of ordinary tuberculin. On the whole and in spite of some unfavorable reports, it seems probable that the conjunctival method has some points of superiority over the cutaneous inoculation. It is applicable to adults, and a positive reaction speaks strongly in favor of the presence of tuberculosis, a negative reaction having less significance. Although a final opinion as to its value can not yet be given, its simplicity, painlessness, and harmlessness serve to commend it to the general practitioner, and also to the Navy for employment at its recruiting stations in suspected tuberculosis—thus, helping to keep out of the service those latent cases that are such important factors in the spread of the disease on board ship.

Conjunctival typhoid reaction.—Working along the same line as Calmette, Chantemesse claims that he has successfully applied a similar method to the early diagnosis of typhoid fever. He uses an aqueous extract of the pulverized and sterilized typhoid bacilli, thus obtaining their endotoxin. A small amount, a half or a third of a milligram of the toxin is instilled into the lower conjunctival sac. The typho-toxin being a local irritant, the instillation is often followed by some burning, lachrymation, and injection, which, however, in a nontyphoid patient disappears within five or six hours. In typhoid fever, however, the conjunctivitis reaches its height in

twelve to twenty-four hours and persists several days. In some cases the reaction was positive several days before a positive Widal test could be obtained. The conjunctivitis produces very little subjective discomfort and never any unfavorable complications. The method has not yet been generally tested, owing to the great difficulty of obtaining a proper toxin. Further work is necessary to establish the value of these reactions for diagnosis.

Diagnosis of tuberculosis by Bloch's method.—In the sputum it is usually possible to recognize tubercle bacilli by means of their staining reaction, although even here cases have been reported in which the presence of other acid-fast bacilli has led to false diagnoses. In the urine, however, these other bacilli, especially the smegma bacillus, are so common that it is hardly ever possible to be absolutely certain that the stained sediment actually contains tubercle bacilli. Rolly has recently shown quite conclusively that only by means of the inoculation of animals, especially guinea pigs, can we positively demonstrate the presence or absence of tubercle bacilli in the urine. This method, however, has hitherto been very tedious. It has usually been necessary to wait two or three months until the animals died of disseminated tuberculosis for fear that, if they were prematurely killed, a slight tuberculous infection might be overlooked. A method recently devised by Bloch has, however, done away with this discouraging delay. The sediment is injected into the animal's groin. The inguinal glands, palpable as tiny kernels, are then picked up in a fold of the skin and crushed between the fingers. If the injected sediment contains tubercle bacilli, the inguinal glands will, within eight or nine days, have attained the size of a hazelnut, and a spread from their cut surface will contain multitudes of tubercle bacilli. Smegma and other acid-fast bacilli apparently do not proliferate in the crushed glands. Bloch's method represents a valuable aid in the diagnosis of urogenital tuberculosis. Primary tuberculosis of the guinea pig can be excluded by a preliminary injection of half a cubic centimeter of tuberculin, which kills tuberculous guinea pigs without affecting healthy ones. Joannovics and Kapsammer, however, state that in all their experiences, extending over many years, they have never found a guinea pig affected with primary tuberculosis.

Tests for occult blood in stomach contents, stool, and urine.—Schroeder has found that the guaiac test for invisible blood is most delicate if the amount of blood present bears a definite relation to the amount of guaiac used. An excess either of blood or of guaiac impairs the delicacy of the reaction. He makes three dilutions of the guaiac. Into the first test tube he puts 5 or 6 drops of a 20 per cent tincture of guaiac (freshly prepared) and 1 c. c. of absolute alcohol; into the second, the same amount of alcohol and 1 drop of the guaiac tincture;

into the third, the same quantity of alcohol and a few drops from the first test tube. Equal parts of turpentine are then poured into each tube, and finally 1 c. c. of the etherial extract of the substance to be tested. In this manner one of the tubes will represent the most favorable possible conditions for a blood test. Einhorn has modified the benzidin test for occult blood in an ingenious manner. Filter paper is soaked in an alcohol extract of benzidin and dried. The paper so prepared is immersed in the etherial extracts to be tested and a few drops of peroxide of hydrogen added. If blood is present, the blue color appears promptly.

Ileus.—Ewald calls attention to the importance of early and repeated gastric lavage in all cases of suspected intestinal obstruction, as well for diagnostic as for therapeutic reasons. At a time when the symptom complex of intestinal obstruction has not yet become well defined, particularly long before feculent eructations or fecal vomiting occur, the stomach contents obtained by means of lavage have a fecal odor. Such stomach contents indeed can be obtained at a time when the existence of ileus can hardly be more than suspected. (R. M. K.)

THERAPEUTIC.

Therapeutic employment of lactic acid producing bacteria.—Metchnikoff and Lane have long insisted on the importance of the colon as a source of toxic absorption, and other observers have shown that a diet of fermented milk quickly frees the intestine of its ordinary flora and substitutes a vigorous stock of acid-producing bacteria. Since Metchnikoff put on the market his lactobacillin, other manufacturers of biological products have offered tablets of "compressed lactic-acid bacteria," and these have been used quite extensively for various diseases in which fermentation in the colon plays an important part.

The use of this fermented milk promises much in the treatment of protozoal infections of the intestine. It is probable, judging from theoretical considerations and from published reports, that the substitution of hostile organisms for those that are symbiotic will accomplish as much in the treatment of tropical dysenteries as a change of climate. Indeed, the relief of dysenteric symptoms attending return to a temperate region is reasonably considered due to a change in intestinal flora, the favorite bacteria for necessary symbiosis being replaced by unfavorable species.—*P. A. Surg. H. W. Smith.*

ABSTRACTS.

DAVIS, L. Renal tuberculosis. Boston Medical and Surgical Journal, January 2, 1908, pp. 1-5.

Of the many disease processes affecting the kidney, Davis recognizes tuberculosis as one of the most important and at the same time the one presenting the greatest problem in diagnosis and treatment. He

states that it is now very generally agreed to be, in the vast majority of cases, of hematogenous origin and primary in that organ, *as far as the urinary tract is concerned*, the process extending in the direction of the urinary current to other tissues and organs, which become involved secondarily. In a similar restricted sense, it is said, the various elements of the male genitalia may be the seat of primary tuberculosis of hematogenous origin, the disease in any one of these extending to others, always in the direction of the secretory stream. Or, again, tuberculosis of the genital organs, a frequent complication, may occur simultaneously with, and independently of, a focus in the kidney; but never, apparently, does the kidney become involved from a prior infection of organs lower down in the tract. Tuberculosis is probably never actually primary in the kidney in relation to the whole body, in the sense that the initial focus occurs in that organ, for other and earlier foci probably always exist in the lungs, lymph nodes or elsewhere, which, though clinically quiescent, allow the escape of sufficient tubercle bacilli into the blood stream to secondarily infect the kidney.

Tuberculous cystitis of greater or less severity is a common complication of tuberculosis of the genital organs and the kidney, and in this fact lies, perhaps, the greatest source of error in the diagnosis of renal tuberculosis, for the bladder involvement may have come from any one of a number of direct sources, including the kidney, and yet the symptoms will mask the more obscure but primary disease of the kidney. It is recommended as a good rule, therefore, never to be satisfied with the diagnosis of tuberculosis of the bladder. Sometimes the symptoms and signs point unquestionably to the kidney, but oftener there is nothing certainly indicative, and the disease progresses for several months or years without apparent impairment of the general health. A pyuria without symptoms is always suggestive of kidney involvement and should call for investigation. The tuberculin test is of little value in locating the infection, and if there is extensive disease of one or both kidneys it is said to be distinctly dangerous. A negative reaction alone is of possible value. In suspected cases careful examination of the urine for pus and bacilli is indicated, as both will be present in all cases of renal tuberculosis except where the lesions are so incipient that they do not communicate with the uriniferous ducts. Recent investigations seem to show that it is possible for tubercle bacilli to be excreted in the urine of tuberculous individuals through sound kidneys; hence the importance of finding pus as well as bacilli. Miliary tuberculosis does not, as a rule, produce pus and tubercle bacilli in the urine, but as such cases are inoperable they need not be considered. In seeking to reach a diagnosis the tubercle bacillus must be conclusively distinguished from the smegma bacillus by procedures calculated to avoid possible contamination with this

organism in drawing the specimen and by the guinea pig method of Bloch. Moreover, cystoscopy should be resorted to in every case in which nephrectomy is contemplated to determine, not only the renal source of the disease, but the functional soundness of one of the kidneys. To this end the urine obtained by ureteral catheterization should be subjected to careful chemical, microscopical, and bacterological tests, and if that from one ureter is found to be free from albumin, pus, and bacteria the kidney of the corresponding side may be given a clean bill of health. The presence of pus alone in the urine of that kidney which it is sought to establish as healthy is a forbidding sign and calls for exhaustive search for tubercle bacilli. In addition to the above operation may be considered to be contraindicated only by an active process in the substance of the prostate gland, and probably, also, an active double tubercular epididymitis. (F. L. P.)

HYGIENE AND SANITATION.

By Medical Inspector H. G. BEYER, U. S. Navy.

KURITA, S., Marine-Stabsarzt, Tokio, Japan. Uber die Steigerung der Eigen-wärme der in hoher Temperatur Arbeitenden (on the increase of body temperature of men at work in a high temperature). Arch. F. Schiffs-und Tropen-Hygiene, 1907, Bd. XI, Heft 21, p. 681.

Kurita observed the temperature, pulse, and respiration in 28 men, working in the fireroom and coal bunkers and in 6 men, at work in the engine room, on board H. M. S. *Itsukushima*, during one of her cruises in tropical waters. He noticed that the former showed a higher body temperature, a more rapid pulse rate, and a greater number of respirations than did the latter. The men in the fireroom did more muscular work and had to do it under a higher temperature than the men in the engine room. The following table is a summary of these observations:

	Average room temperature.	Body temperature.			Pulse.	Respiration.
		Maximum.	Minimum.	Average.		
	°F.	°F.	°F.	°F.		
28 firemen	114.80	102.4	99	100.7	103	30
6 engine-room men	106.00	99.7	99	99.35	89	.....

NOTE.—Converted into Fahrenheit from centigrade.

Of the 28 firemen, 2 gave a temperature from 102.2° to 102.4°; 17 a temperature from 100.4° to 102.0°; 7 a temperature from 99.5° to 100.2°; and 2 a temperature from 99.0° to 99.3° F.; while not a single one of the engine-room men gave a temperature above 99.7° F.

The rise in body temperature, in both groups of men, began thirty minutes after going on watch and reached its maximum during the

last or fourth hour. After the first hour's rest, in a room with a temperature varying from 75 to 85° F., the temperature of the firemen went down to an average of 99.5° F. and at the end of the second hour's rest it had reached 99° F.

Based on these observations, Kurita recommends that the temperature in firerooms be reduced by means of a more efficient ventilation and that a period of rest of at least two hours' duration be allowed the men after their watch.

KORSCHUN, Dr. S. W., Privatdocent. Zur Frage der Verbreitung des Abdominal typhus durch Trinkwasser (a contribution to the question of the spread of typhoid fever through drinking water). Arch. F. Hygiene, 1907. Bd. 61, p. 336.[a]

Some of our most valued sanitary measures in common use to prevent the spread of certain water-borne infectious diseases are based upon the length of time that pathogenic germs are able to live and remain virulent in waters once contaminated with them. As is well known, Pettenkofer believed that water had no share in the transmission of either typhoid or cholera, and, after him, Emmerich remains the chief exponent of the same views.

Emmerich was the first to show that flagellates, occurring normally in many different waters, played an important rôle in the destruction of water bacteria, including the bacilli of typhoid. He showed that flagellates, taken from waters previously inoculated with cultures of typhoid bacilli, were filled with these bacilli, each flagellate containing from 5 to 20, the bacilli at the same time showing distinct signs of degeneration. Emmerich claims that the function of the flagellates in water is analogous to that of the leucocytes in the blood; both represent the natural defenses against the invasion of their respective territories by foreign substances.

But while the fact, first pointed out by Emmerich, of the destructive influence of flagellates upon bacteria in water has been abundantly confirmed, it has, likewise and long since, been ascertained by a host of competent observers, and established as a fact, that typhoid as well as cholera bacteria, in spite of the presence of flagellates, remain viable and virulent for weeks and even months, and their transmissibility to man, through the medium of water, therefore, remains unshaken.

Korschun and Huntemüller, in their experiments, noticed that, whenever the quantity of a typhoid culture with which a certain quantity of water was contaminated was small, typhoid bacilli remained traceable for a much longer time in such water than when

[a] From the hygienic institute of the University of München—Director, Prof. M. Gruber.

the quantity of contaminating culture employed was large. Huntemüller attributes this result to the fact that large amounts of culture fluid give rise to a rapid increase of flagellates, which in their turn eat up a large number of the bacilli and, hence, the more rapid disappearance of the latter and the greater difficulty in tracing them.

The experiments of Korschun give a typical illustration of the work done by the flagellates in water, artificially contaminated with typhoid cultures: 50 test tubes each received 10 c. c. of tap water and one-tenth öse of a typhoid culture; flagellates were found present in all but one, and in two of the test tubes other infusoria, beside flagellates, were found to be present. On the ninth day, an examination of the test tube containing no flagellates, showed 43,000,000 bacilli per c. c., while the examination of one of the tubes in which the flagellates were numerous gave only 300,000 bacilli per c. c.

This as well as all the other experiments plainly demonstrated the destructive work done by the flagellates among the bacteria in water; but, since Korschun, as well as many other experimenters, found living and virulent typhoid bacilli in contaminated waters fifteen days after inoculation and in spite of the great destructive execution done by the flagellates, the fact of the transmissibility of typhoid fever through water must still be considered as remaining undisputed and in value unimpaired by Emmerich's discovery.

Fürth, Dr. Ernst, Marine-Oberassistenzarzt. On artificial and natural Plague-infection of Fishes. Zeitschr. f. Hygiene r. Infectionskr., 1907, Bd. 57, Heft., p. 315.[a]

The question is, Can plague-infected rats, thrown overboard, and known to serve certain fishes as food, cause the latter to become vehicles of the disease?

The use of full virulent cultures in his experiments made it impossible for Fürth to use running water in his aquaria; this same circumstance compelled him to choose goldfishes to experiment on. These animals are known to swallow small pieces of liver, spleen, and lung tissue from plague-infected rats with great avidity.

Besides feeding these fishes with plague-infected organs from rats, intramuscular injections with virulent cultures (48 hs.) were made use of. While it could not be proven that the attempted infection of these fishes with virulent plague material had succeeded, it was shown that virulent bacilli passed from the intestine into the water, five days after feeding, without the fishes having shown the least symptoms of any disease. In the inoculation experiment, the bacilli

[a] An experimental study from the hygienic institute at Hamburg, Director, Prof. Dr. Dunbar.

were found to pass into the body fluids and to survive there for a longer time, likewise, without producing any symptoms in the animals during life, nor any notable changes in their organs, examined after death.

From these observations it would seem as if the possibility of a transmission of plague, under certain conditions, through the medium of certain fishes, could not be altogether denied; nor that the throwing into the water of plague-infected rats from ships could be regarded as entirely free from dangerous consequences.

RIEGEL, Marinestabsarzt. Citric acid and solar rays as a means for the disinfection of drinking water for military purposes. Arch. f. Hygiene, 1907, Bd. 61, p. 217.[a]

A simple and effective method for disinfecting drinking water, especially one that is applicable to colonial warfare and small naval landing parties in tropical countries still remains to be discovered. A number of ingenious methods, employing a variety of chemical substances, such as potassium permanganate, chlorine, bromine, iodine, peroxide of hydrogen, etc., have from time to time been devised and actually used with success, but all these necessitate the presence on the spot of apparatus that can not always be provided, especially not under the above-mentioned conditions. When, therefore, Liefmann, in 1902, showed that typhoid bacilla could be killed in water containing 0.5 per cent of citric acid in solution within thirty minutes, a method for the sterilizing of drinking water by simpler means and without the presence of complicated apparatus seemed to have been suggested.

Riegel, without knowing at the time of previous experiments in the same direction, began to experiment with a lemonade containing 6 per cent of citric acid and 5 per cent of cane sugar. Those examined were typhoid bacilli, Flexner's dysenteric bacillus, and the vibrio of cholera. Of these three groups of bacteria, the vibrio of cholera was found to be the most sensitive to the acid solution, the typhoid the least sensitive, and the bacteria of dysentery occupied a position about midway between these two. Riegel was able to show that cholera germs were killed in from fifteen to thirty minutes, the dysenteric bacilli in from five to six hours, and the typhoid germs in from twenty-two to twenty-four hours in a lemonade of the above-mentioned composition.

The results, therefore, of Riegel's experiments with lemonade alone would indicate that this method was applicable to cholera-infected water only and providing that half an hour's time could be given to the exposure before the water had to be consumed.

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[a] From the hygienic institute of the University of Berlin. Director: Prof. Dr. M. Rubner.

Riegel next included sunlight as an additional factor in his experimental problem. This factor, very naturally, it would be easy to call into requisition in the Tropics as a very powerful aid. Since the sun's rays in the experiments of Riegel had to pass through the glass walls of the vessels in which the exposures occurred and were, consequently, deprived of their most active ultraviolet rays, the results may be assumed to have fallen somewhat short of what might be expected to occur under the more favorable conditions in the Tropics.

In spite of this disadvantage, the very careful experiment of Riegel may be considered as having demonstrated conclusively (1) that cholera germs, when exposed to the July sun in a lemonade containing 6 per cent of citric acid and 5 per cent of cane sugar in solution, are killed within five minutes, notwithstanding the fact that the sun's rays had to pass through the glass walls of the vessels containing the inoculated lemonade before reaching the germs; (2) that dysenteric bacilli, under identical conditions, are killed within one hour, and (3) that typhoid germs are killed within one and one-half hours.

Better results than the above may be expected in the Tropics with the lemonade in vessels admitting the direct action of the sun's rays, which are there known to be especially rich in ultraviolet rays.

The method is certainly simple and may prove very useful under certain conditions and at times when the apparatuses for carrying out the more complicated methods are not at hand.

Belli, C. M., Capitano Medico ed Torcello, Tenente Medico, nella Regia Marina. Alterazioni e ricambio dell' aria sulle cacciatorpediniere (the change in and the renewal of air on board torpedo boat destroyers). Annali di Medicina Navale, 1907, Vol. II, fasc. IV, p. 461.[a]

Two factors must enter into the calculation of the available air supply of all inhabited quarters, namely, the free cubic space and the frequency with which the air in it is changed or renewed. While in the living quarters on board a ship the air space is in general very small as compared to that allowed by hygienists for urban homes, the air supply itself is purer and the means for bringing about more frequent changes are more efficient.

The quarters for the men on board the torpedo boat destroyers have indeed reached such extremely narrow limits that overcrowding has become the rule, and we are very much indebted to the authors for a thorough investigation of this subject.

Belli and Trocello examined several boats of the *Elbing* type. One of the authors, indeed, took up his residence on board one of them while these investigations were going on. The following conditions were found: The air space in the forward quarters of the men amounted to 34 cubic meters; these gave berth to 22 men (after de-

[a] An experimental research.

ducting those on watch) the boat being at anchor. This would leave per individual 1.54 cubic meters, which is about equal to the space in a coffin for an adult and, since the human body itself occupies 0.60 cubic meter, the available remnant of space for breathing, per person, is reduced to 0.94 cubic meter. Since the compartment is irregular in shape and the men are obliged to sling their hammocks in two rows, one above the other, the lower row runs about one-half meter above the deck and the upper one 1 meter above it.

The question to be answered first of all was: Is this overcrowding compensated for by an efficient ventilation, or is the air in this compartment confined?

The question is of great importance, for even in crowded quarters, but with an efficient ventilation, as is the case, for example, in railroad cars, the atmospheric vitiation resulting from the products of respiration may be kept within normal limits through ventilation.

The ventilation was a natural ventilation and effected through the following apertures:

(*a*) Six circular portholes (*hublots*) on the port side, each of a diameter of 17 cm.

(*b*) Seven identical portholes on the starboard side.

(*c*) One small entrance opening with a hood, looking aft on the upper deck, having the dimensions of 0.98 by 0.61 m.

(*d*) Two air trunks with movable cowls (hand); diameter of 26 cm.

(*e*) Two eyes for the passage of anchor chains, protected by a small hood of a diameter of 15 cm., from which the volume of the chain must be subtracted.

The observations were made by means of an anemometer registering directly the number of cubic meters of air, passing through the apertures. Observations were taken at five different points of each opening and the average of these was recorded as the quantity of air passing through any one of the different openings per minute. In fine weather, when all the ports could be kept open, air entered through the portholes on one side and through the lower half of the entrance port and passed out through the portholes of the opposite side, the upper half of the entrance port, the air trunks, and the eyes.

From various observations, taken on days without wind, a mean air-supply of 800 cubic meters per hour was calculated which is equal to 36 cubic meters per hour per person. The locality having a cubic capacity of 34 cubic meters, the air was changed 24 times in one hour. The change of air occurred with dangerous frequency and the quantity of air, thus supplied per hour per person, was but little smaller than the minimum requirement demanded by hygienists. Such an air renewal, it was believed, could not be borne without dangerous consequences.

Very different, however, were found to be the conditions during the colder season, when all the openings, except those through which the chains pass, were closed. The compartment is opened up in the morning after hammocks are called and ventilated; while during the night, the air can pass in and out only through the anchor holes and, for a very little while, also through the entry, whenever a change in the watch occurs. Measurements have given variable results. By whatever method, however, the examinations were made, the average quantity of air passing through the compartment was about 20 cubic meters per hour or a little over half the amount contained in the compartment. This makes the air practically confined and the compartment as good as closed. That the air was indeed foul, the authors could notice sufficiently, whenever they entered the compartment in the morning, shortly before hammocks were called. From an hygienic point of view, the two conditions have a different significance.

In overcrowded quarters, but with a sufficient ventilation, the danger consists chiefly in the diffusion of infectious material (dust, small particles of liquid, etc.).

In the former conditions the authors found the air was renewed 24 times in an hour, something that rarely occurs in urban homes, and general hygiene only admits of an air-change of three times per hour. Belli, however, had already before demonstrated the fact that sailors were able to resist without apparently dangerous consequences, air renewals of much greater frequency than that, and the reviewer made the same observations during his studies of the ventilation on board the U. S. S. *Prairie* in 1902. (See Surgeon-General's report.)

In confined quarters, to the dangers already mentioned must be added those due to the physical and chemical alterations in normal air. The most essential impurities concerning us here emanate from the men themselves through respiration. A man in repose emits in the first place 23 liters of carbonic acid gas in one hour. Assuming that the quarters in the winter remain closed for nine hours, e. g., from 8.30 p. m. to 5.30 a. m., the 22 men sleeping in the dormitory emit collectively 4,554 liters of this gas. Thus, taking into calculation only the amount of carbonic acid produced by respiration and neglecting that which is already contained in normal air and that coming into it from other sources, the proportion of the gas in the 34 cubic meters of space in the dormitory must reach 12 per cent.

Such results as these are in such striking contrast to what we know of the salubrity of living quarters in general as to leave us entirely unable to understand how living in such quarters can be made compatible with either health or even life itself. We would naturally suppose that the hygienic conditions of such quarters could not help being reflected in the sanitary statistics furnished by the men.

Nevertheless, as a matter of fact, from their observations, the authors were bound to conclude differently: *The sanitary conditions, as shown by the statistics, could not be pronounced different from those furnished by the other ships.*

This divergence between what was expected and what was actually found, tended to make chemical and bacteriological studies of the air still more interesting. The results of their studies in ventilation were obtained during the winter season and during a time of day when the conditions for natural ventilation were the least favorable and the contamination of the air in the dormitories reached its highest degree. The authors examined the air by physical, chemical, microscopical and bacteriological methods.

PHYSICAL.

The temperature was from two to three degrees higher than the outside temperature. Under a temperature of 13° C. and an outside relative humidity of 70 per cent, 96 to 98 per cent of relative humidity, inside, was the rule and saturation was often reached.

CHEMICAL.

1. Carbonic acid in air, collected half an hour before hammocks were called, at the height of both the upper and lower rows of hammocks and determined according to the method of Pettenkofer, as shown in the following table:

	Quantity of CO_2 in per cent.			
	Minimum.	Maximum.	Mean.	Mean of all observations.
At height of 1 meter from deck	9.9	10.8	10.1	11.4
1½ meters	12.3	13.1	12.8	

2. Organic matter was collected in water and determined by the method of Kubel-Tiemann, 100 liters of air being examined at a time. During the day with ports open, 0.0028 grm. of O was required to oxidize the organic matter contained in 1 cubic meter of air; after the apartment had been kept closed for nine hours, a minimum of 0.009, a maximum of 0.019 grm. or a mean of 0.016 grm. of O were required to oxidize the organic matter in 1 cubic meter of air.

3. Tests for chlorine, nitric and nitrous acids were always negative; ammonia was occasionally found, but, since this is contained normally in the air, no importance could be attached to it.

4. Sulphuretted hydrogen, negative.

5. Saliva.—In order to detect small particles of saliva two methods were employed: That of Fehling and Nylander and the one with Petri dishes placed on the floor and filled with sterilized distilled water and left over night. With the first saliva could not be demonstrated at all, and with the second traces of it only were detected twice.

MICROSCOPICAL.

Found hairs, threads, epithelial cells, wood fibers, and small particles of coal dust.

BACTERIOLOGICAL.

With the locality empty and with all the ventilators in running order there were found in 1 cubic meter of air:

Bacteria	760
Hypho-and blastomyceti	1,740
Total germs	2,500

In the morning, after the locality had remained closed for nine hours, there were found—

Bacteria	1,320
Hypho-and blastomyceti	6,060
Total germs	7,380

Those that occurred more frequently were the chromogenic cocci, bacterium fluorescens liquef., bacillus subtilis, bacterium mesenteric, vulgatus, and radiosus; numerous were the hyphomycetes, rare the blastomycetes.

With mouth germs, positive results were obtained with prodigiosus, artificially introduced into the mouth, aided by Petri's dishes of gelatine, open and standing at a distance of 0.5 to 1½ meters from the inoculated individuals, during the night.

ANIMAL EXPERIMENTS.

In order to collect pathogenic germs 500 liters of air were passed through distilled water, centrifugalized, and the residue injected into the peritoneal cavity. Result entirely negative. All the experiments made with the view of finding gaseous toxic substances proved negative. Thus the attempt at finding poisonous gases in foul air once again has failed.

In the foregoing experiments the authors have shown that the air in the men's quarters of torpedo boats of the Elbing class, after a closure of nine hours, with 22 men sleeping in them, shows the following changes: (*a*) An increase in humidity; (*b*) an increase in organic matter; (*c*) an increase in CO_2; (*d*) an increase in the number of germs, and (*e*) a general diffusion of mouth bacteria in the atmosphere.

Belli and Trocello have shown once more that men are able to live for a long time in an atmosphere containing 10 per cent of CO_2 without danger to life and health. These authors also are convinced that CO_2 determinations are still our best measure for the condition of the air, although they were unable to find any poisonous substance that accumulated pari passu with CO_2 in the air.

The quite extraordinary tolerance of CO_2 by the men on these torpedo boats is explained by these authors as follows: (1) The men are young, strong, and carefully selected for the duty; (2) the men live almost constantly on deck in the best of air, out of resting hours; (3) the men are obliged to stand watch, part of the time, three nights out of four, and (4) their having to sleep in such air from necessity creates the habit and they get used to it.

Notwithstanding, the authors strongly recommend an efficient ventilation for such quarters, combined with some system of heating during the cold season.

BELLI, C. M., Cap. Med. Royal Italian Navy, and TROCELLO, E., Tenente Med. Viciation and renewal of air in submarines. Annali di Medicina Nav., January, 1908.[a]

The introduction into navies of vessels known as "submarines" has opened up an entirely new and rather interesting chapter in naval hygiene. The conditions of existence on board these vessels are indeed so extraordinary that the normal standards of general hygiene cease to be applicable and new standards must be created to meet the new requirements. The most important of the hygienic problems to be solved on these vessels are those connected with the changes that take place in the atmosphere inside of them.

At the present day the construction of submarines proper has been abandoned in every navy and submergible torpedo boats instead are being built. These vessels have a portion of their superstructure above the surface of the water. They are, in this way, in a position to effect ventilation through air trunks and commanding towers and to make longer passages. Under such conditions there exists but little difference between submarines and torpedo boats. The difference begins at once when these vessels are propelled entirely beneath the surface of the water and have to be hermetically sealed.

The questions then to be settled are: What changes occur in the inclosed air? Which one of the changes is the predominating one? What means have we for the recognition of danger signals? What methods had best be adopted to counteract the changes occurring in the air under these conditions?

Belli and Trocello have made a careful study of these questions, and their well-known skill would guarantee the great value of the results of their experiments. The subject of their experimentation was a typical submarine of 150 cubic meters capacity with a complement of 12 men aboard.

They began by studying the causes of atmospheric viciation. These were as follows:

[a]An experimental research from the naval hospital in Venice.

1. *The 12 men on board.*—They withdraw from the 150 cubic meters of the inclosed air every hour 300 liters of oxygen and pour into it 276 liters of carbon dioxide; they add 1,500 c. c. of water, which is enough to completely saturate the 150 cubic meters of air at a temperature of 11° C.; they also produce 2,400 calories of heat per hour, which would raise, without dispersion, the inside temperature to 51° C. (124° F.); and, finally, they bring a modicum of atmospheric dust in their clothes, which also passes into the atmosphere.

2. *The engines.*—These cause physical as well as chemical changes to take place. Under navigation above the surface the air received additions from naphtha or petroleum; during navigation beneath the surface, from the storage batteries. From the hydrocarbons, volatilized at 60° to 70° C., when oxidized completely, there result carbon dioxide and water; there are also produced small quantities of the lower oxides of nitrogen, nitrous and nitric acids; and small amounts of hydrocarbons escape through the joints and pass into the air.

While all these impurities would be removed immediately by powerful ventilators during navigation above the surface, small portions remain in the atmosphere, upon the sudden submersion of the vessel, after the naphtha or gasoline engines are stopped and the electric engines have begun work.

The amount of consumption of naphtha varies with the velocity, from 80 to 240 kilos per hour; the number of calories produced varies from 1,136 to 880,000. Most of this heat is converted into mechanical energy, but small portions escape into the interior.

The storage batteries consist of a series of lead plates, separated by sheets of rubber and immersed in receptacles, containing dilute sulphuric acid. When connected, the metal acts upon the acid; hydrogen gas is developed and this, in part, reduces the sulphuric acid and produces sulphurous acid and sulphuretted hydrogen, both of which pass into the air.

Small quantities of volatilized mineral lubricating oil pass into the air. The seventeen 16-candlepowered incandescents contribute 510 calories of heat per hour to the air. The immersion being effected through water ballast by means of air, under a pressure of 2,000 atmospheres, air sometimes escapes during this maneuver and this increases the inside pressure.

While the chemical and physical changes in the air that depend upon human life are constant, those due to the engines depend upon the varying activity of the latter. For these reasons the authors distinguish three periods in every operation of submarine boats: In the first period, while navigating above the surface with the naphtha engines, volatile hydrocarbons and mineral oils are developed; in the second period, while the submarine is propelled under water by the electric motors, gases are developed from that source; in the third

period, during which the vessel returns to the surface, the naphtha engines resume work. Hence, it results that the changes produced during each one of these three periods not only differ among themselves, but the first series of changes is continued for a short time into the second and this into the third, and so on. The changes produced can therefore not be calculated, but must be determined by direct analysis.

The material for examination was collected on board during four submersions and transported to the laboratory.

Changes in the air may be discovered (1) by the nose—gaseous impurities, such as sulphuretted hydrogen; (2) by physical test—temperature and pressure; (3) by chemical test—the amounts of oxygen, carbon dioxide, sulphurous acid, sulphuretted hydrogen, volatile hydrocarbons, carbon monoxide, ammonia, nitrous and nitric acid and chlorine; (4) by the microscope—atmospheric dust.

By means of the olfactory sense, the authors discovered that the air after a two hours' submersion had acquired an intensely moldy odor with an additional irritating quality, due to the presence in it of small quantities of hydrocarbons and of sulphurous acid. Physical tests showed that the temperature varied but little, rising on an average from 2° to 3° C. above that of the air outside. Steel being a good conductor, and the vessel being completely surrounded by water, the heat produced is quickly dispersed, and hence only the slight rise in inside temperature. This rise, of course, must vary with the temperature of the water. The atmospheric pressure rose on an average 1 m. m. above that of the outside. Humidity reached, on an average, 85 per cent, and in some parts complete saturation was shown to exist. The chemical analyses showed that there was a mean diminution of oxygen in the inclosed air from 21 to 19.6 per cent. A part of this diminution is attributed by the authors to oxidation of hydrocarbons, since such a large amount of consumption of oxygen could not be accounted for by the number of men present. The carbon dioxide present amounted to 9.6 per cent after an immersion of two hours, with a maximum of 11 per cent and a minimum of 8.9 per cent. The amount of CO_2 produced by the men alone would have increased the amount in the air to only 5 per cent; the remainder, therefore, must have come from sources other than respiration. The sulphurous acid, at the end of a two hours' submersion, had reached 0.01519 gram in 1 cubic meter of air, with a maximum of 0.03202 and a minimum of 0.00341 gram. Sulphuretted hydrogen was found in the proportion of 0.00049 gram per cubic meter. Hydrocarbons amounted to 0.1449 gram per cubic meter of air. Since this quantity had been found to be present before submersion and did not increase during submersion, the authors believe it to be a sure indication that they came from the naphtha and not from the mineral lubri-

cating oils. Tests for carbon monoxide, chlorine, ammonia, nitrous and nitric acids were always negative. The microscope revealed the usual impurities found in outside air.

In summarizing their results the authors conclude that the physical changes observed by them have only a limited significance. The temperature is kept within limits easily tolerated and without inflicting serious damage upon the human organism. In the cold season the temperature in submarines is rather low, while during summer it rises not rarely to 30° C. (86° F.) and is accompanied by high humidities; the authors are disposed to attribute to the high humidities the feelings of oppression experienced on submarines after a prolonged submersion. The pressure variations are so slight that no deleterious influence can be attributed to them.

Much greater importance is attached to the chemical changes that were found by the authors. The air inside submarines shows (1) quantitative variations in its normal constituents and (2) gaseous additions from outside sources.

The variations in normal constituents consist in a decrease in oxygen and an increase in carbon dioxide. The loss in oxygen is not great enough to be dangerous, since asphyxia is not produced until the atmospheric oxygen content sinks to 10 per cent. The increase in CO_2, though undoubtedly quite considerable, does not reach the toxic dose, generally held to be ten times that found by the authors.

The gaseous additions from outside sources are classified by the authors as: (*a*) Indifferent, hydrogen; (*b*) irrespirable, sulphurous acid; and (*c*) poisonous, hydrocarbons and sulphuretted hydrogen. Hydrogen has no special action. Sulphurous acid gas has, on the other hand, a very energetic action upon the organism (0.05 per cent can not be inhaled without suffering and 0.24 per cent kills rabbits in about four hours). Although only small amounts were found by the authors, they believe enough of it was present in the air to explain the sense of suffocation that they experienced whenever the submersion was at all prolonged beyond the usual time. They believe that the presence in the air of sulphurous acid is an indication of grave danger and want its development in larger quantities guarded against. Sulphuretted hydrogen, likewise a poisonous gas, killing a dog when present in the proportion of 0.125 per cent, being one of the causes of asphyxia in miners and the cause of a disease called "yellow sickness," was found to be present in such small quantities that its influence upon health may be disregarded: the same applies to the quantities of hydrocarbons that were found.

From the above results Belli and Trocello conclude that none of the changes in submarine air observed by them so far can be considered dangerous to or incompatible with life. In their aggregate, however, they may become capable of serious consequences when submersion is

prolonged, because they increase progressively with the time of submersion.

An interesting question is that of the establishment of a danger signal. The olfactory sense becoming quickly blunted, the physiological signal for those inclosed is abolished. If the ordinary standard limits of carbonic acid were accepted, the danger limit would be reached at the end of twenty-three minutes after submersion, calculating upon the amount of CO_2 produced by the men alone ; but, since it was found that the largest quantity of CO_2 came from other sources, even this brief time would become still shorter. In practice, however, things take a different aspect. While a sojourn in a submarine is not an agreeable one, it is possible, according to the personal experience of the authors, to live and work in such an atmosphere without appreciable suffering for two hours. The carbonic-acid test, therefore, can not be applied here. In the absence of either the olfactory test or the carbonic-acid test, the only practical guide recommended by Belli and Trocello for submarines consists in a few small mice kept in a cage; whenever these begin to die, they believe that danger also begins for the men. Mice are especially useful for this purpose, because they are extremely sensitive and much less resistant to the influence of the dangerous gases accumulating in submarines during submersion, and the method seems to have done good service and stood the test on board some of the English submarines.

Another important question which arises is that dealing with the prevention of changes in submarine air—the sulphurous acid and sulphuretted hydrogen coming from the storage batteries. If it was possible to inclose these in air-tight cases containing solutions of iodine both gases would be detained and not pass into the air. The hydrocarbons and carbon dioxide derived from the explosive motors could be lessened in amount by the selection of a naphtha, volatilized at a higher temperature, and the installment of more efficient ventilation. But all these precautions would not completely accomplish the desired results and enough sources of viciating changes and alterations would remain to require additional means for attenuating the noxious influences of the air upon the health of the crew. To begin with, the men selected for submarine service must be not only strong and vigorous, but free from the least trouble with the respiratory organs, such as catarrhs, etc. The most important means, however, concern the ventilation. A partial relief may be effected by supplying fresh oxygen in place of that consumed. But the experiments of Belli and Trocello have shown that the losses in oxygen are of no consequence, while the irrespirable impurities of the air would remain unaltered by the mere addition of fresh oxygen. A total renewal of air may be effected by the introduction of compressed air. In this manner not only would the lost oxygen be replaced, but all the other

impurities would become diluted and their influence on the organism attenuated. But in this way the pressure would be materially increased, and to the dangers of submarines would be added those of the diving bell.

In the actual state of our present knowledge on this entire subject perhaps the most convenient means for preventing the changes above mentioned are fulfilled through the decomposition of peroxide of sodium in cold water. The oxygen set free during the decomposition takes the place of that which has been consumed and the soda, set free during the same reaction, fixes both the carbon dioxide and the aqueous vapor and, according to Desgrez, renders innocuous, through oxidation, the toxic substances from expiration. Peroxide of sodium likewise eliminates sulphuretted hydrogen and sulphurous acid gas. Practical tests must decide this question.

The apparatuses so far proposed for effecting the regular and automatic purifying function of solutions of sodium peroxide do not appear to the authors to possess any practical value for submarines. In their opinion the construction of these apparatuses must be based on the principles that a definite quantity of the peroxide is to be made to fall into water, kept in the lower part of the room, and in such proportion as to maintain a constant atmospheric pressure; and that a ventilator is necessary to provide for a continuous renewal of the contact between the inclosed air and the reagent. The authors believe that the construction of such an air apparatus presents no very great difficulties; they calculate that 200 grams of sodium peroxide per man per hour would be required to bring about the desired object and all that now remains to be done is to see whether the method may be practically applied to submarines.

REPORTS AND LETTERS.

INTERNATIONAL CONGRESS FOR THE PREVENTION OF ALCOHOLISM.

Medical Inspector H. G. Beyer, who represented the Medical Corps of the U. S. Navy at the meeting of this Congress which convened at Stockholm, July 28, 1907, reports as follows:

While it will be impossible in this report to refer to all the papers that were read at this congress, it was deemed desirable to make a careful selection from many of them of the points of the greatest interest and importance to the service. For the convenience of arranging the subject-matter of this report, it has been divided into three parts, namely: Historical, scientific and military.

I. HISTORICAL.

The history of the influence which alcohol may have exerted within historical times upon human development is still unwritten, and any attempt to write it would probably fail on account of the absence of recorded data sufficiently accurate to base upon them conclusions of the required value. Dr. Johan Bergman, of Stockholm, during his researches in this direction, however, has succeeded in finding evidence to account for both national as well as racial degenerations that have from time to time occurred in certain quarters of the globe, in history. He has, moreover, also furnished certain data from recent observations that would seem to show and explain the possibility of the occurrence of a regeneration on a grand scale, in a whole nation, and as evidenced by improved public health, by increased longevity and by an increased refinement in mental culture, through the reintroduction of habits of sobriety into a nation once addicted to the use of alcohol. Most interesting as well as significant appears to be the fact that the alcohol question attained its greatest importance first in certain regions of the world, namely, in the northernmost countries (Scandinavia, England, and North America) and in the tropical world (Buddistic and Mohammedan countries), in other words, in the coldest and hottest regions of the globe. This fact can scarcely be considered accidental and is attributed to the effects of alcohol being more dangerous in these extremes of climate than in the more temperate ones, and, consequently, more easily and plainly recognizable in these regions.

While the general history of alcoholism is admittedly quite incomplete, the history of the more modern antialcoholic agitation is much better known. In the different countries in which this agitation is being systematically pursued—and this means all those countries which we are in a habit of classifying as civilized—this history shows that the agitation has followed a process that is typical for them all—namely, at first the movement was somewhat platonic, timid, not aggressive, losing itself in theoretical considerations on the necessity of greater moderation, and finally failing through injudicious legislation without first enlightening the public through systematic instruction with regard to the effects of alcohol in all its different phases on human conditions; in other words, failing on account of the lack of an intelligent public opinion. Next there follows a period of a more forceful agitation, led for the greater part by ministers of the gospel, and directed more especially against the stronger alcoholic liquors, such as whisky, brandy, etc. Finally a much more radical movement is inaugurated against all alcohol-containing drinks, including beer and wine. It certainly is a fact, both interesting and significant, that the older the antialcoholic movement in a country is the sooner also this last phase in the development of the antialcohol agitation has entered the arena. Thus, in Americano-Anglican countries it began in 1830-1840, in Norway in 1860, in Sweden in 1870, in France it has only just begun with the introduction of the Order of Good Templars into that country.

This typical development seems like an adaptation to an inexorable law of nature, for what we have here seen as having occurred in a whole nation is, what also occurs in the case of a single individual. The ontogenetic development of the antialcohol sentiment is but a repetition in the individual of what has occurred in the history of the whole phylum of man. The only thing that is necessary is that the individual study the alcohol question seriously and intelligently.

Absolute prohibition is the last and latest phase in the antialcohol movement and seems to be the only logical sequence in its further development.

Dr. A. E. Lidström (Örebro) in a historical paper on the Inebriety of the Ancient Inhabitants of the North brought out some valuable points. He referred to the already well-known difference shown by history to exist between the nations of the extreme south and north. While in tropical countries races of different origin have succeeded each other in rather rapid succession, in regions of the north we find people to-day whose ancestors have been living there ever since the stone age. The current of immigration has, indeed, always been from north to south, the stronger northern people always taking the place of the weaker nations of the south. It is also known to history that the ancient Egyptians, Greeks, and Romans, after a period of

glory, fell victims to excessive inebriety and became an easy prey to the invader.

An additional explanation for this may, moreover, be found in the fact that alcoholic drinks were used in the Tropics for hundreds of years before they were known in Germanic Europe and the Scandinavian North. The present beverage known as beer was not known in Germanic countries until the fourteenth century, and the pernicious drink habit as we understand it to-day dates back scarcely a century. When, therefore, we say that alcohol did not prevent Europeans from making themselves masters of the world in the sciences, arts, and industries, we should remember that the foundations for this mastery were laid during an age without alcohol and at a time when a very mild beverage was indulged in only occasionally.

Doctor Lidström concludes:

Unless the present general indulgence in alcoholic drinks will cease or is successfully combated, the future of Europeans will never compare favorably with their present greatness.

II. SCIENTIFIC.

The scientific side of the great movement against alcohol has at all congresses and at all times received a large share of the attention on the part of both the leaders and members of temperance organizations. The reason for this is easy to see. A correct conception, a concise knowledge of what alcohol is and does, is of fundamental importance to the whole question and must precede all organized efforts against it, if these are to be successful. The proceedings of the congress at Stockholm were both impressive and instructive in this respect. Physicians, jurists, teachers from elementary schools, professors from colleges and universities, army officers, railway officials, and representatives of the press, all read important scientific papers and took a leading part in the discussions of them. To one not familiar with the deep-going interest and widespread organized movement against the use of alcohol that has taken possession of most all the countries of Europe, such an exhibition of serious and earnest endeavor can not help appearing profoundly impressive and instructive.

One of the most important papers was that read by Prof. Taav. Laitinen, of Helsingförs, on The Influence of Small Doses of Alcohol on the Resistance of the Animal Organism, etc. This author is already well known through his former contributions to scientific literature on the same subject. Laitinen fed rabbits and guinea pigs with the smallest doses of alcohol (0.1 c. c. per kilo of animal), living under identical conditions with control animals receiving only water. In order to test the changes in the resistance which these animals underwent, after about eight months, he employed the

finest biological reactions. Their resistance was tested through either autoinfection or through direct inoculation with diphtheria toxin. Suffice it to state that the alcoholized animals showed less resistance than did the control animals. The hæmolytic power of rabbits' blood was likewise impaired and so was the bactericidal power. No difference, however, was noted in the concentration of the O-H- ions. Of the young born from alcoholic rabbits 61.29 per cent died and 38.71 per cent remained alive, and of the young born from rabbits having received water only 54.17 per cent died and 45.83 per cent remained alive. The young born from alcoholized rabbits weighed on average 79 grams when three days old and increased in weight during the first twenty days, 7.13 grams daily; while those born from water-fed rabbits weighed 87.9 grams and grew 9.46 grams daily. The same was found to be true for guinea pigs but in a still more striking manner.

Prof. Max Kassowitz (Vienna), in a paper entitled Alcohol-Diet and Alcohol-Therapy sums up his conclusions as follows: (1) Alcohol is a narcotic poison, differing little from chloral, chloroform, and ether. (2) Alcohol is neither a good food nor a bad food, but a poison first attacking and finally destroying all protoplasmic substances. (3) Those who attribute to alcohol a nutritive value base their opinions upon the well-established fact that alcohol is oxidized (burned) within the organism. This assumption would be justified if muscle worked like a machine in which energy is obtained by the burning of combustible materials. In reality, however, muscular activity depends upon the assimilation and the disassimilation of two substances of which muscular fiber is composed and, therefore, only those substances can be regarded as a source of power for the living organism that can be converted into living protoplasm; never those that are only known to destroy it by their poisonous action. (4) With this conception, both the results of scientific experiments as well as those of daily practical experience are in the most perfect accord. Sportsmen know from daily experience that alcohol, after a slight but temporary stimulant effect, impairs physical power, while even very small doses of sugar or proteid material will increase it. (5) Very recently the theoretical nutritive value of alcohol was again brought forward and maintained, in consequence of some experiments supposed to have shown that during the second hour, after taking alcohol, the relative proportion of the inspired oxygen to the exhaled carbon dioxid had become so changed as to justify us in assuming that a substance richer in oxygen than fat was being burned (Durig). Against such a conclusion there are two very weighty arguments: (*a*) Alcohol is oxidized so rapidly that very little of it remains in the organism the second hour after consumption and (*b*) the much more plausible ex-

planation was entirely overlooked, namely, that through the toxic action of alcohol on the liver cells an unusually large amount of cleavage of liver-glycogen occurs and that to this cleavage is due the change observed in the respiratory quotient, erroneously attributed to the combustion of the long since oxidized alcohol. (6) As is the case with most of the narcotic poisons, the paralyzing action of alcohol is preceded by a brief and temporary stage of stimulation. It is not advisable to make use of this property in cases of disease, on account of the never-failing depression that follows and which neutralizes not only the short-lived stimulant effect but acts injuriously on the already fatigued bodily functions in the diseased state. (7) The often-mentioned warming effect of alcohol is based objectively upon a scientific error and subjectively upon an illusion. It is believed that the heat resulting from the combustion of alcohol assists the organism in its efforts at the reestablishment of the lost equilibrium in heat economy. In reality, however, the nervous heat-regulating mechanisms are paralyzed by alcohol, and this fact abundantly explains not only the lowering of the bodily temperature in chloralized rabbits, but also the frequently occurring deaths of alcoholized human beings. (8) The administration of alcohol in infectious disease has the object of either shortening the lives of the pathogenic germs or supporting the organism in its struggle against them. Exactly the contrary effect is produced. It is now well known that alcoholics are much more susceptible (and much less resistant) to germ invasion and succumb more frequently to these infections than abstinents. (9) To the great disadvantage which every recommendation for giving alcohol by physicians has, must be added the still greater evil which is in this way done to the community. Every such medical support in favor of alcohol causes the struggle against the use of this widespread public poison to become more difficult.

Robert Tigerstedt (Helsingfors), in a paper Ueber den Nährwert des Alcohols, concludes that alcohol is not to be recommended as a food, in spite of the fact that it possesses a certain nutritive value.

Finally, Louis Backmann (Upsala), in an interesting series of observations with small doses of alcohol on the isolated heart of the rabbit, has shown to my mind conclusively that alcohol is not a substance capable of maintaining the activity of such a heart and exerts no nutritive effect upon it.

The above-cited experimental results on the effects of alcohol, obtained by the different European investigators, seem to be in the most perfect accord with the results attained recently by American physiologists. Salant also attributes to alcohol the rapid elimination of glycogen from the liver; he, moreover, asserts that resistance to infectious disease is in part dependent upon the glycogen-content of the liver, and consequently alcohol must be looked upon as directly

diminishing resistance instead of increasing the same, as was ordinarily supposed.

Since alcohol in small doses, furthermore, has been shown to increase the oxidizing power of the animal organism with reference to certain definite chemical compounds, as was recently demonstrated by Reid Hunt, it is not improbable that further experiments may show a close connection to exist between this power and the rapid disappearance of liver glycogen in animals under the influence of small doses of alcohol.

The present outlook with regard to the alcohol question seems to be that alcohol in all its forms must disappear from the market, not only as a condiment but also as a drug, and Doctor Vogt (Christiania), in a paper entitled Alcohol and Medicine, expressed the opinion that in former times, when other narcotics of the fatty series, such as ether, chloroform, paraldehyde, chloral, etc., were still unknown, the therapeutic indications for the use of alcohol were in a measure justified, but that at present they were without the slightest scientific foundation. He insisted that alcohol, even in hospitals, should be administered only on the very strictest indications.

The influence of alcohol on the preservation of the human species was more ably handled by Prof. A. Forel (Der Alkohol und die sexuellen Fragen). This well-known scientist, after tracing with convincing and crushing logic the health and strength of the individual to sound hygienic conditions on the one hand and to natural or artificial selection on the other, questions the very use of a rational selection as long as we will continue to create new degenerative varieties in our germ cells by taking poisons like alcohol, hasheesh, opium, and other poisons. This artificial degeneration of germ cells Ford has called "blastophtorie." To blastophtorie are traced the degenerations of children (statistics by Demme), many of the tuberculous, neurotics, criminals, and insane. He mentioned the growing numbers of degenerates among the recruits of countries in which the consumption of alcoholic drinks has been on the increase for many years past (France and Switzerland) and the improved conditions among recruits in countries in which the consumption of alcohol in every form has been on the decrease for at least the last twenty years (Sweden and Norway). From all his arguments it would follow with terrible consequence and without an avenue of escape that alcohol is dangerous to the individual, the community, and the race alike from every point of view and in every form.

III. MILITARY.

The important relation which the use and abuse of alcohol among both officers and men bears to the efficiency of an army and navy seems to have become, within recent years, the subject of serious study, to judge from the papers that were read at the Stockholm con-

gress on this topic by Major Toegel, of the German army, and Lieutenant Liljedahl, of the Swedish army. If temperance is of such far-reaching importance as was shown in the foregoing pages, it must, of course, follow that its influence upon an army and navy must be still greater. In the naval and military representatives of a people we see the flower of the nation, the extract and essence of its physical and moral power, in its formative period of development. During this period the habits acquired, whether good or bad, will continue to dominate men for the remainder of their lives.

Major Toegel, after a most painstaking and careful study of this question, pointed out that, in spite of the immense amount of work done in this direction, but little good had as yet been accomplished against the drink habit either in the French, English, American, or German army. He dwelt upon the fact that, in view of the important difference that existed between the battles of the past and those of the future, the requirements put upon the individual soldier's endurance have immensely increased. While the battles of the past began at daylight and ended at sunset, those of the future will continue for days and nights together and can not be stopped for either hunger or thirst nor on account of the prevalence of good or bad weather. Such hardships require a good store of physical energy and of moral courage to draw from and this can only be acquired in times of peace and through the most careful training and attention to all points bearing upon the personal hygiene of officers and men.

According to Major Toegel, the battles of the future will be much less a question of the deployment of heroic deeds and of personal bravery than they will be questions of a struggle between technical superiority and reserve nerve power. The former is a matter of military administration, the latter is the result of personal hygiene with special reference to a personal knowledge of the injurious effects upon such energy, worked by alcohol. Major Toegel recommends that officer's clubs and men's canteens be furnished more as places for sports, plays, lectures, and as reading rooms than as drink halls; all drinks to be free from alcohol. The all-powerful example of officers in abstaining from alcoholic drinks was especially insisted upon.

Lieutenant Liljedahl spoke of the excellent work done by the officers of the Swedish army in the temperance cause. The temperance association, founded in 1905, stands on an absolute abstinent basis, having for its object not only the spread of the knowledge concerning the effects of alcohol among the men from the sportsman's and from the military point of view, but also the scientific study of it in its bearing on military problems. Thus, reference was made to Lieut. B. H. Boy's experiments, in which it was shown that already very small doses of alcohol were sufficient to impair the capacity for aiming and the accuracy of sighting as well as to decrease the number of hits in a given time.

THE EIGHTH INTERNATIONAL RED CROSS CONFERENCE.

Medical Director J. C. Wise, U. S. N., represented the Medical Corps of the Navy in the deliberations and discussions at this important meeting, which was held at London, June 10 to 15, 1907. In his report Doctor Wise necessarily confines himself to a review of the work in general, giving more detailed attention only to such subjects as were likely to be of interest to the naval service. After touching upon the opening ceremonies and briefly explaining the origin, purposes, and disposition of the interests on the Empress Augusta Fund and the Prize Fund (the latter was founded by Her Majesty, the Dowager Empress of Russia), in the interest of Red Cross work, he proceeds to comment upon the extent and value of the exhibit, the reports and papers presented, and the resolutions adopted or considered, etc., as follows:

The admirable display (200 objects) of competing exhibitors was held at Earle's court and will require special notice later on.

Diplomas of honor were awarded as follows: To the Russian Red Cross Society for its remarkable exposition of organization and material employed during the campaign in Manchuria; to the German Red Cross Society for its beautiful exposition of model ambulance trains; to the Italian Red Cross Society for its very interesting exhibit of photographs and diagrams, illustrating the campaign against yellow fever; to the Japanese Red Cross Society for the remarkable exposition of its activity during the Manchurian campaign; and to the "St. John's Ambulance Association" in testimony of appreciation of its work in past wars and public calamities.

The awards of prizes were as follows: A prize of 6,000 roubles, divided equally between - first, Le Général C. O. Milan (Russia), for a Finnish chariot, called Waldberg-Spennort System, for transport of sick and wounded; second, Col. H. Hathway (England), for "Fourgeon d'ambulance," which has rendered great service in the East Indies.

A prize of 6,000 roubles divided equally between - first, M. le Dr. Auffret (France), for his "Brancard Gouttire-Auffret" for the transport of wounded on shipboard. This brancard has been adopted in the French navy. It consists of a metallic gutter, in which the invalid rests in a semirecumbent position, and by means of two wheels in front can be used as a rolling chair; it is also arranged for suspension; second, M. Linxveiler (Germany), for his different systems of electric suspension brancards in railroad wagons.

A prize of 6,000 roubles, divided equally between - 1st, Messrs. Christoph and Unmack (Germany), for the Doecker barrack hospital; 2nd, M. le Dr. Boland (Holland), for the equipment of a post of succor and transport by means of bicycles.

The Amercian exhibit was meager, consisting of: 1st, "The Stokes Splint Stretcher;" 2nd, "The Lung Apron Stretcher;" 3rd, "The Chadwick Carrier."

In regard to the Red Cross appliances and recent inventions exhibited at Earls-Court, attention must be briefly called to that of Russia and Germany. Nearly every provincial society of the German Empire was represented in this country's exhibit, and the intense "amor partiae" of this great people is nowhere better shown than in its desire to forestall every need and provide all reasonable comfort for those who are wounded in defense of the country. Thus, the province of Bavaria was represented by: First, the Medical Voluntary detachment of the Red Cross of Munich, which exhibited a military field railway carriage with complete hospital equipment, and a sledge arranged for transporting the wounded; Second, the Medical Voluntary detachment of the Red Cross of Hamburg, which exhibited a large boat arranged for transporting wounded, with all accessories.

Worthy of mention in the British section was the motor ambulance of the St. John's Ambulance Association.

The sectional hospital on the Doecker system used by the Red Cross in war and peace requires some detailed notice. The idea is that of Captain Von Doecker and has been realized by Messrs. Christoph and Unmack, now of Niesky, Germany. This hospital may be described as a flying barracks; it can be speedily erected or taken down; it is light in weight, occupying little space when packed; of great strength, fireproof, and easily disinfected. No better comment can be made than to quote Doctor Von Coler, General Staff Director of the German Army:

"A careful, systematic test of the Doecker barrack has taken place in seventy-one barracks, in all parts of the German Empire, under the most varying climatic and local conditions, particular attention being paid to speed of erection by unskilled workers, to portability, to resisting power against wind and the pressure and weight of snow, and to various other important qualities from the standpoint of administration. Careful inquiry was made as to the water and air-tight qualities of the walls on which protection against the inclemency of the weather depends, and also as to the heating and ventilating possibilities with respect to the requirements of winter and summer. The most important result of these trials is the acknowledgment that Doecker barracks built on the lighter system not only afforded satisfactory shelter, but fulfilled every requirement of a perfect hospital."

General Priou read a report on "The place and rôle of women in sanitary formations and hospitals in time of war." He calls attention to the growth and the increasing importance of the work of women as evidenced by the splendid service rendered by them in time of war. The American Red Cross is fully alive to the importance of this subject.

M. de Logui (representing Argentine) presented the following proposition: "That in all countries where Red Cross societies are organized

there be established in time of peace a permanent service, to lend aid (when called upon) to the victims of public calamities, etc.," which was referred to the International Committee.

M. le Docteur Duchassoy, Founder and Secretary of the Association of the Dames Françaises, reported "The Nature of the Aid that Neutrals can Render Belligerents and those they can not Render." Two questions were involved:

1. Can one belligerent oppose the sending of succor destined only for the sick and wounded of the other belligerent? It was contended that to deny this was an act of inhumanity, but with regard to sending stores other than medicines there appeared a diversity of opinion.

2. Can neutrals do anything for the relief of the sick and wounded in besieged cities? After discussion of this question, the writer submitted the following affirmative propositions: (*a*) By the gift of medicines and objects useful in the treatment of the sick and wounded; and by the gift of restoring drinks in the cases where the ambulances or hospitals of one belligerent are not sufficient.

(*b*) By the evacuation of the sick and gravely wounded of a besieged city; the evacuation to be under the care and responsibility of the neutral nation. The first proposition was accepted, but the second was reported to the International Committee.

The following are extracts from the decision of the central committee of the American National Red Cross concerning the resolutions of the St. Petersburg Conference (1902).

The American National Red Cross heartily indorses the principles of the Hague Convention in relation to war at sea; the society intends putting itself in relation with the Medical Service of the Navy, in order to be able to render such assistance as it is able and which will be required of it.

The central committee of the American Red Cross considers that the sick and wounded of a belligerent placed under the neutral jurisdiction of the United States should be respected by the Red Cross without respect to nationality.

The central committee, after careful examination of the question of assistance to prisoners of war, in accord with the terms of the Hague Convention, expresses the conviction that the American National Red Cross should charge itself with such assistance, and affirms that it will cordially do so.

The American National Red Cross does not submit the nurses to special instruction, but recruits them from among the thousands of nurses of this country who have prepared themselves for the emergencies of war or great calamities.

The American National Red Cross will do all in its power to prevent the abuse of the name and insignia of the Red Cross.

Aid and succor in cases of great national calamities are the primordial objects of the American National Red Cross.

An interesting discussion arose in connection with the relation of the Red Cross to the fight against tuberculosis, and was setted by the acknowledgment of the desirability of this object, which, however, must be left in the hands of the national organizations for their own solution.

"Rôle of Societies of the Red Cross in Naval War," was the subject of a report presented by G. H. Makins, member of the Board of Consultation of the Medical Service of the Navy, and is the most considerable contribution, made in English, to this important subject. After explaining the conditions of naval war, Mr. Makins describes the medical department of the ship of war, of the hospital ship and of base hospitals. In regard to the type of hospital ship, the general administration of naval hospitals, of personnel, equipment, provisioning, etc., this report is original and valuable.

M. Renault (France) presented the conclusions of the special commission of the Red Cross at sea, as follows:

1. To ask the Hague Conference to adapt the principles of the last Geneva Convention of 1906 to the needs of navies in the same way that the principles of the Geneva Convention of 1864 were made applicable to maritime warfare, by the diplomatic convention signed at the Hague on the 29th of July, 1864.

2. To request the maritime powers represented at the London Conference to make provisions for the organization in their respective capitals of special commissions to sit permanently, to be composed of representatives both of the Red Cross Society and of the navy, whose duty it shall be to take immediate steps, during the present time of peace, to insure the active cooperation of the Red Cross societies in case of maritime war.

3. That during the intervals between the assembly of the International Conference, the central committee of the Red Cross societies of all maratime countries should agree on the best way to exchange reports and proposals dealing with the rendering of assistance in maritime warfare.

This exchange of views and ideas would prove an efficacious means of securing on sea the same useful work now carried out by the Red Cross on land.

On this subject the conference adopted the following resolution:

That in the various countries, under such form as is convenient and according to their particular organization, there be established between the administration of the navy and the societies of succor, ties of such a nature as to facilitate the latter in rendering useful assistance, and to obtain means necessary to the exercise of their charitable action.

The report of the Austrian Red Cross shows considerable activity in connection with what may be required of it in maritime war.

Thus, there are various depots for stores, and an "ambulance maritime," which is composed of one or two ships of the Austrian Lloyd, to be equipped in the port of Trieste. These ships accommodate 100 hammocks each. Besides this material provision, the Red Cross Association possesses a fund of 82,000 crowns for its ambulance account.

In Europe there appears to be a perfect *entente* as to what the navy would require of the Red Cross in time of war. The president of the international committee states, "The administration of the marine communicates, officially and regularly, that which in case of mobilization we ought to undertake in the interest of the marine; in consequence, we already have the equipment and the personnel necessary for the lazarets and for a hospital ship."

The careful and valuable reports of the Russian and Japanese Red Cross societies will not be presented here, as these societies have been previously reported on by officers of the Navy specially detailed for this purpose.

O

SPECIAL ARTICLES.

THE TREATMENT OF TUBERCULOSIS BY THE ADMINISTRATION OF MERCURY.

(Second paper.)

[From the U. S. Naval Hospital, New Fort Lyon, Las Animas, Colo., May 25, 1908.]

By Surgeon BARTON LISLE WRIGHT, U. S. Navy.

Medical Inspector C. T. Hibbett, U. S. Navy, in transmitting Doctor Wright's second paper on the treatment of tuberculosis by mercury, expresses it as his opinion that the paper is a most valuable contribution to medical literature, and goes on to say: "We are almost convinced that mercury judiciously used is a specific in the treatment of tuberculosis in all its forms. It should be borne in mind that some of the cases therein reported were, at the time that mercurial treatment was commenced, apparently at death's door, and there can be no doubt their lives were saved by the drug. In case No. 1 the condition was so bad that Doctor Wright had given up hope of life, and considered the patient beyond treatment; but on my suggestion mercurial treatment was applied, with the result reported. We have received numerous letters of inquiry from all sections of the country as to the manner of administration, etc. It is scarcely necessary to more than suggest that treatment of tuberculosis by mercury should be practically confined to hospitals, where the administration can be judiciously and safely made and results in each case carefully noted."

Since the date of my first paper, March 1, 1908, the results obtained by this method of treating tuberculosis have been exceedingly gratifying, both to the patients and to the staff of this hospital. So far the improvement in the majority of the cases under treatment has exceeded our most sanguine hopes, and when it is taken into consideration that, with one or two exceptions, all of them have well or far advanced pulmonary lesions, and many have serious complications, the great beneficial effect of the drug appears more pronounced.

I am convinced that in mercury we have a specific for tuberculosis, and that the only question remaining to be decided is: How long will it take to effect a cure? During the administration of the drug the well-established rules for the treatment of tuberculosis, embracing rest, fresh air, proper food, proper sanitary surroundings, attention to personal hygiene, the avoidance of all excesses

of animal appetites, and the selection of climate, must be carried out.

Since my last paper, in which I reported the cure of two cases of secondary tubercular ulceration of the throat (cases 1 and 2), three other similar cases have been cured and one improved. These embrace all the throat involvements that have been under treatment.

Among the tubercular conditions which have shown marked improvement under the treatment are: Pulmonary lesions; lesions of throat and upper air passages, and lesions of the genito-urinary tract, involving kidneys, prostate, and epididymi. I feel sure, however, that had we lesions of other organs or tissues under treatment they would also improve.

That the patients fully realize the beneficial effects of the treatment is proven by the increasing number of voluntary applications for its administration. We now have 40 patients in the clinic, all of whom, with the exception of 8 or 10, state that they are feeling better in every respect. Their general condition is improved, and, in the vast majority of those whose lesions have been examined since starting treatment, there has been a demonstrable improvement of the local condition which in many instances has been quite marked. I know of no other method of treatment that gives results equal to that we are obtaining from the administration of mercury.

The thought has naturally occurred to us, and it has also been suggested, that the profession will consider these cases as a mixed infection of tuberculosis and syphilis. In this connection, however, I will say that, in conversing with several well-known authorities on tuberculosis, they expressed it as their opinion that tubercular patients, having syphilis as a complication, gave a very unfavorable prognosis, and that the administration of mercury for the cure of the syphilitic infection was contraindicated by the tubercular involvement, stating that the drug hastened cavity formation in tubercular pulmonary areas and increased the extent of excavations already present. Moreover, the text-books on therapeutics give tuberculosis as a contraindication to the use of mercury. These opinions are held by the profession at large, and in a recent medical journal, over a well-known signature, I saw in substance the following, the exact wording of which I quote as nearly as remembered: "In tuberculosis complicated by syphilis, the prognosis is unfavorable; the more remote the syphilitic infection, the better the prognosis."

We have demonstrated that these opinions are fallacious, evidently originating with and erroneously taught by therapeutists whose dictum in the matter has been accepted for years without a sufficient test of the reliability of the teaching—or, if mercury has been tried

in defiance of accepted rules, its action in tubercular cases was not closely watched until I began my observations at Pensacola in the spring of 1905, and continued them at this hospital in February, 1908. If the marked improvement in the tubercular lesions which we have mentioned is due to the clearing up of the syphilitic infection, then by all means let us inoculate our tubercular patients with syphilitic virus and treat that disease, with the knowledge that as the syphilis is cured the tubercular lesions will improve also. But I do not think this heroic measure necessary, for I am convinced that the drug recognized as a specific in syphilis has a most marked beneficial and curative effect upon that other "infectious granulomatous disease," tuberculosis. If these cases that I am reporting are tuberculo-syphilitic, then the profession must reverse its opinion that "the prognosis of a tubercular case complicated by syphilis is very unfavorable." It was while treating tuberculo-syphilitics in 1905 that I first realized the value of mercury in tuberculosis.

Among the 40 cases under mercurial treatment is one with the most advanced pulmonary lesions—entire lung area involved, with a large cavity in the lower left lobe, posteriorly, who was admitted January 25, 1908 (temperature 103°, pulse 130, respirations 40, weight 105½ pounds), and thought to be in a dying condition. He now weighs 123 pounds, which is but 4 pounds below his normal weight. His case is given in detail later on. We now have 40 cases taking the treatment—7 with cavities, 30 with advanced pulmonary lesions, 2 that are moderately advanced, and 1 case in which the disease is confined to the genito-urinary tract. In all these cases the tubercle bacillus has been demonstrated a number of times. In the case in which the genito-urinary tract is involved beaded tubercle bacilli have been repeatedly demonstrated in the urine (this case has just been placed on mercury).

It would be quite remarkable to find, in these 39 cases, with pulmonary involvement so pronounced and with the tubercle bacillus demonstrated in the sputum of each, that the treponema pallidum was the causative agent of their present condition—especially as syphilitic lesions are not frequently found in the lungs, other organs, and tissues such as the nervous system, being the more common sites of syphilitic activity.

Of the 40 cases under treatment, 28, or 70 per cent (5 of which have had three or less injections), are improving. It is hardly probable that of these 28 cases, in 26 of which syphilis can not be demonstrated, all are syphilitic, and that their improvement is due to the effect of mercury on this disease. Is it not more probable that the mercury is acting favorably upon the tubercular process?

Of these cases under treatment, 28 of the 40 (5 of which have had three or less injections) are improving, or a percentage of 70. It is

hardly probable that out of these 28 cases, in 26 of which syphilis can not be demonstrated, all of them are syphilitic, and their improvement due to the effect of mercury on this disease. Is it not more probable that the mercury is favorably acting upon the tubercular process?

If we had incipient or a greater number of moderately advanced cases under treatment, I am convinced that the progress toward improvement would be more pronounced, though these cases under observation have shown the most remarkable, rapid, and progressive improvement known in the history of the treatment of this disease.

So many applications for definite instructions as to the administration of the drug have been received that it is thought advisable to give the method of procedure we are following.

The general management of tubercular patients is now so clearly and widely understood that this very important part of the treatment will be omitted.

The preparation of mercury used is hydrargyrum succinimidum. Just before the injections are to be given distilled water is boiled for at least twenty minutes. A solution is then made so that 0.64 c. c. (min. x) will be equivalent to gram 0.013 (gr. $\frac{1}{5}$) of mercury succinimide. The syringes and needles are boiled for twenty minutes.

The skin of the patient's buttocks is scrubbed with hot water and tincture of green soap, then washed with alcohol, followed by ether, and this in turn by a solution of bichloride (1–3,000). The surgeon's hands are prepared as for any operation, and sterilized rubber gloves are worn. The patient being in a prone position on the table, the needle is driven deeply into muscle tissues by a quick downward plunge. If no blood escapes from the butt of the needle the syringe is put in place and the drug injected. If blood escapes, a vein has been punctured, and the needle is therefore withdrawn and inserted at another place.

It has been our custom to start with gram 0.013 (gr. $\frac{1}{5}$) of the drug, and to repeat the injection every other day until 15 injections have been given; then to give gram 0.026 (gr. $\frac{2}{5}$) every fourth day until 15 more injections have been administered; then to give gram 0.039 (gr. $\frac{3}{5}$) once a week indefinitely. It is advantageous in some cases to give short courses of potassium iodide at varying intervals in conjunction with the mercury.

The above procedure can not be considered a hard-and-fast rule of routine, for some cases require larger doses and some smaller, and in this the physician must be guided by experience and close observation.

We have now given over 1,100 injections without a single abscess and have struck but five veins.

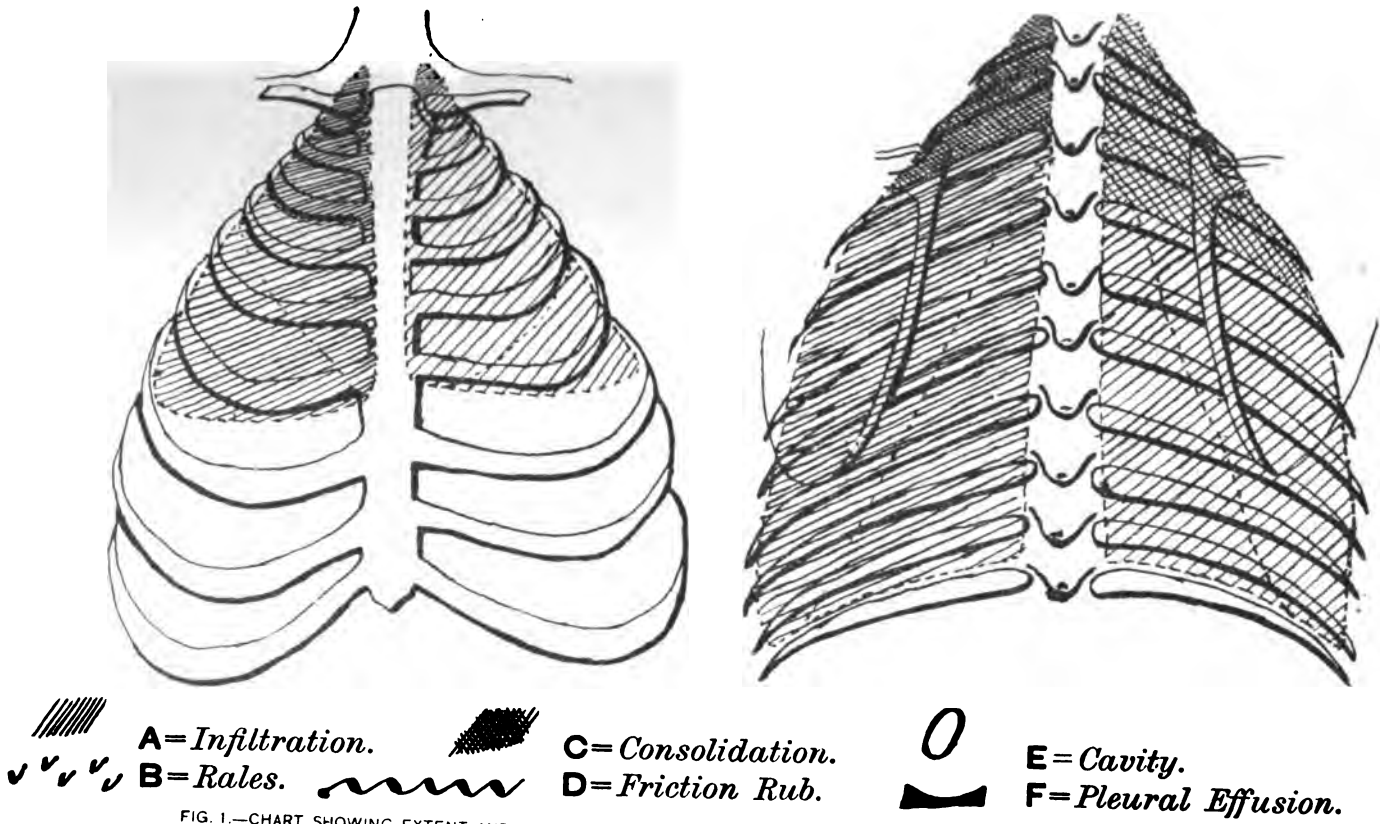


FIG. 1.—CHART SHOWING EXTENT AND CHARACTER OF THE PULMONARY LESIONS OF CASE 1 ON FEBRUARY 20, 1908.

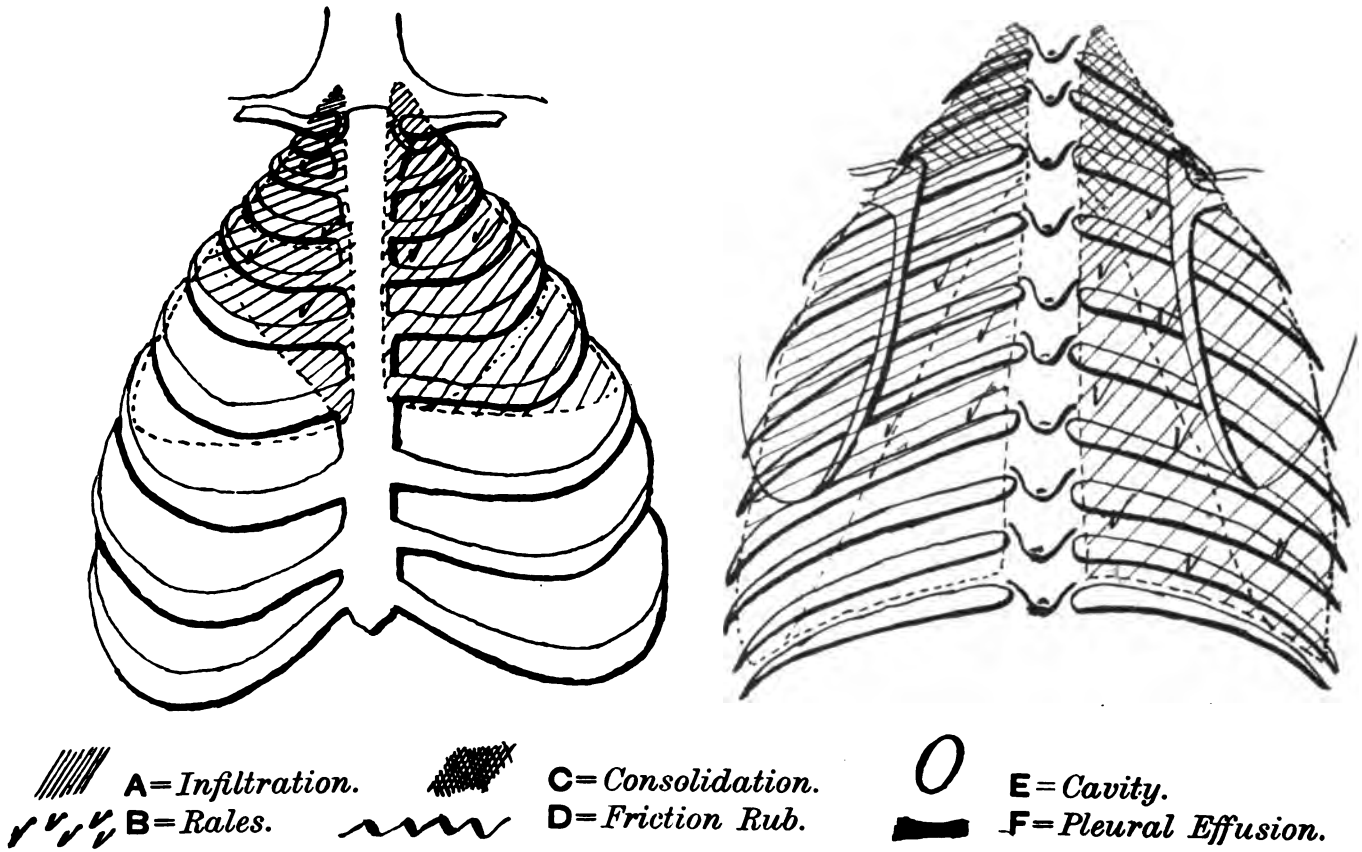


FIG. 2.—CHART SHOWING THE IMPROVEMENT IN THE PULMONARY LESIONS OF CASE 1 ON APRIL 30, 1908.

Now and again in one or two cases it has been found impossible for various reasons to administer the drug by injection, and in these cases mercury has been given by mouth in the following combination:

Hydrarg. chlor. corros	0.324 grams.
Tr. gentian. comp	240.00 grams.

M. sig: Teaspoonful in wine glass of cold water t. i. d. twenty minutes before meals.

This prescription has given excellent results, but does not act so rapidly as the injections.

The introduction of the needle is hardly felt: in about 50 per cent of the cases, shortly after the injection, the region becomes slightly painful and for several hours feels as if it was badly bruised, after which time this sensation usually passes away. Occasionally, a feeling of soreness persists for twenty-four hours.

In the report of cases which follows, cases Nos. 1 and 2 are continued from my last report:

Case No. 1: F. O. D., yeoman third class. This patient was last reported (March 1, 1908) with healed tubercular lesions of nasopharynx, pharynx, and larynx; pulmonary lesions considerably improved; temperature normal; pulse from 85 to 100, and as weighing 118 pounds, which represented a gain of 28 pounds during the preceding six weeks, during which time he had been on mercury by mouth.

On March 5 the p. m. temperature jumped to 101.8° and during the next two days rose to 103°. A careful examination failed to reveal the cause. On March 8 a small white tubercular ulcer appeared on the left posterior faucial pillar. Mercury was at once discontinued by mouth and the injections commenced. The ulcer continued to spread and burrowed deeply into the tissue involved, the temperature, however, gradually falling until the 17th of March, when it had reached normal. The ulcer by this time showed some improvement. The case now entered upon a course of general improvement, and on March 26 the ulcer was about healed, and the patient weighed 124 pounds. On this date, however, the patient complained of pain and soreness in both wrists and ankles, the temperature again rising to 101.8°. This condition was at first attributed to rheumatism and treated as such for several days: but the tenderness and pain increased, the distal extremity of the right radius being the principal point of involvement, and becoming so bad that the patient could not sleep or eat. It then being determined that he was suffering from a mercurial periarthritis or periostitis, this drug was stopped and large doses of K. I. administered.

On April 1 the ulcer in throat was healed. From this date on an improvement was noticed along all lines, except that the patient lost weight, weighing 115½ pounds on April 16. About this time

pain and tenderness disappeared, the temperature fell to normal, the pulse slowed to 80, and he began to regain weight. On April 26 he was placed on the succinimide of mercury, gram 0.039 (gr. $\frac{3}{5}$), once weekly. On April 30 the physical examination of this patient showed considerable pulmonary improvement (see plates 1 and 2 for comparison), No. 1 being the result of examination made February 20, 1908, and No. 2 of that made on April 30. On the last-mentioned date there was no pain, and both cough and expectoration were slight: he felt well, appetite was good, slept well, and bowels were fairly regular.

The laboratory report dated April 24, 1908, is as follows:

Sputum: Negative for T. B.

Blood: Hæmoglobin is 85 per cent. The number white cells per cubic millimeter is 16,720: Lymphocytes, 17 per cent; large mononuclear and transitional leucocytes, 18 per cent; polymorphonuclear neutrophiles, 57 per cent; eosinophiles, 7 per cent; mast cells, 1 per cent.

Urine: Color, dark amber; reaction, acid; specific gravity, 1,030; no albumen; no sugar. Microscopic examination shows: Granular and hyaline casts, cylindroids, squamous epithelial, and small round cells.

His weight at this time is 127½ pounds, a gain since March 1 of 9½ pounds, or a gain since starting treatment (January 17, 1908) of 37½ pounds.

Case No. 2: L. J., sergeant, U. S. Marine Corps. This patient was last reported (March 1, 1908) with healed tuberculosis of the pharynx and larynx and improved pulmonary lesions. His progress since that time has been slow, but uneventful; temperature usually normal, reaching 99° occasionally at varying intervals; pulse from 80 to 90; respirations 14.

On April 28 the laboratory reported as follows:

Sputum: A few T. B. present.

Blood: Hæmoglobin is 80 per cent. Number white cells per cubic millimeter, 13,640: Lymphocytes, 19 per cent; large mononuclear and transitional leucocytes, 13 per cent; polymorphonuclear neutrophiles, 65 per cent; eosinophiles, 1 per cent; mast cells, 2 per cent.

Urine: Color, dark amber; reaction, acid; specific gravity, 1,026; no albumen; no sugar. Microscopic examination shows large amount of pus, mucous cylindroids, squamous epithelium.

On May 3 a physical examination of this patient showed a considerable improvement in the pulmonary lesions, which is well illustrated by plates 3 and 4; there was no pain in his chest; he coughed only when throat was irritated by food; there was no expectoration; throat continued to improve, and in general he felt splendidly; appetite was good; slept fairly well, and bowels regular.

His weight at this time is 122½ pounds, a gain of 14½ pounds since March 1, and a total gain since beginning treatment (February 1) of 18 pounds.

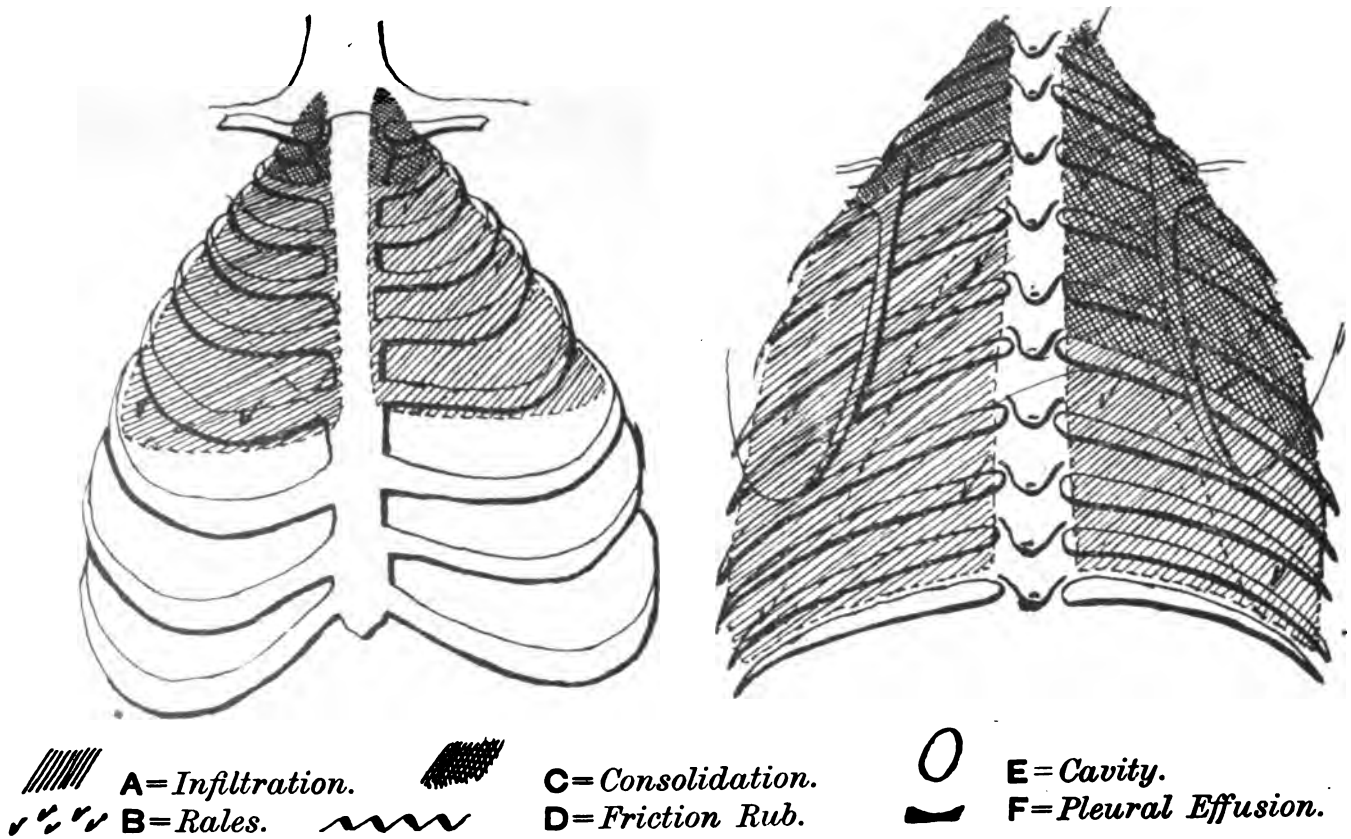


FIG 3.—CHART SHOWING THE EXTENT AND CHARACTER OF THE PULMONARY LESIONS IN CASE 2 ON FEBRUARY 13, 1908.

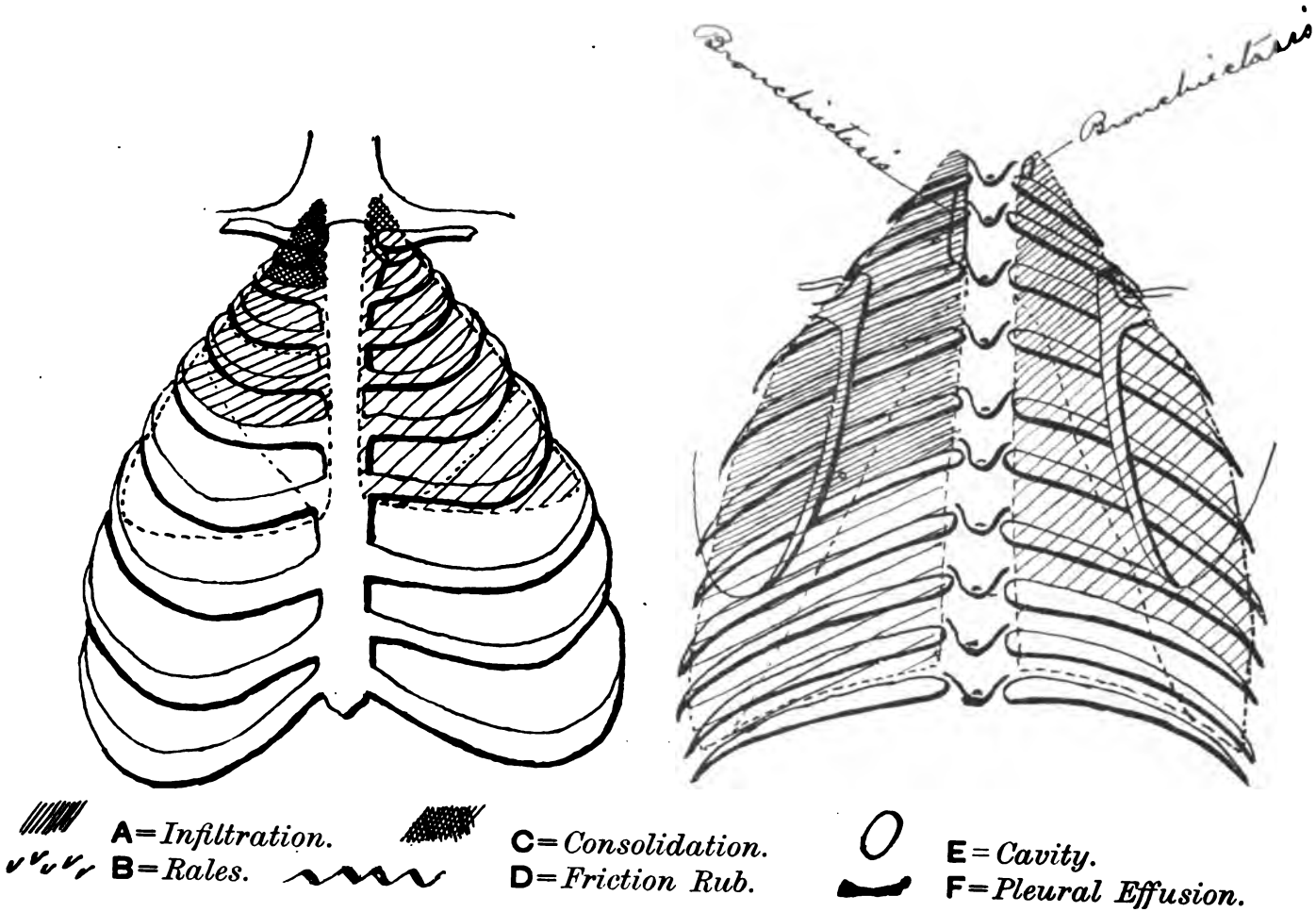


FIG 4.—CHART SHOWING THE IMPROVEMENT IN THE PULMONARY LESIONS OF CASE 2 ON MAY 8, 1908.

The following cases of secondary throat involvement have been cured (one improved):

Case No. 3: S—— G——, private of Marines. Admitted February 29, 1908, with pulmonary tuberculosis and the following tubercular lesions of the throat: "The tip of the epiglottis for one-third of its circumference is eroded by ulcerations; the rim of the glottis shows numerous ulcers; the vocal cords are dull gray in color; and the tissues of the larynx are infiltrated."

On March 2 injections were begun. On March 28 the above-mentioned lesions had entirely healed and remained so.

On April 6 the patient died, and the autopsy showed death the result of a perforation of the small intestine by a tubercular ulcer, the entire length of small intestine showing the typical tubercular ulcers encircling the lumen of the bowel.

Case No. 4: S. F. T., supernumerary, a confirmed user of morphine and cocaine. Admitted February 29, 1908, with advanced pulmonary lesions, secondary syphilis, and the following throat lesions: "Large ulcer on posterior wall of pharynx 1¼ inches in diameter; epiglottis thick and dull red; membranes of the larynx infiltrated and ecchimotic; true cords and rim of glottis ulcerated."

CLINICAL NOTES TAKEN FROM CASE PAPER.

March 2, placed on injection.

March 29, ulcers rim of glottis healed.

March 31, died of profound toxemia and exhaustion; all ulcers of throat showed healing process; those on rim of glottis healed. A group of tubercular ulcers in ascending colon showed fresh granulations.

Case No. 5: S. R. A., M. Att., 3 Cl. (negro). Admitted October 29, 1907, with advanced pulmonary lesions and secondary infiltration of larynx and pharynx; was given special throat treatment from date of admission, but the throat lesions steadily progressed. On March 4, 1908, he applied for the injection treatment, and the first injection was given that day. On March 27 his throat condition ceased to trouble him and on April 5 had entirely cleared up, though his voice remains somewhat husky.

Case No. 6: K—— G——, oiler. Admitted September 16, 1907, with pulmonary tuberculosis. About February 25, 1908, he developed a tubercular ulcer on left faucial tonsil, for which he received special throat treatment until March 16, but ulcer had continued to grow worse. On that date he applied for the injections of mercury, and on March 27 the ulcer was healed.

The following advanced pulmonary cases are selected for report because of the complications existing in each. They illustrate the

extremely beneficial action of mercury under the most disadvantageous conditions:

Case No. 7: S—— V——, coal passer. Admitted with pulmonary tuberculosis.

(Abstract from hospital ticket, dated Naval Hospital, Boston, January 21, 1908.)

Incident to service. Patient has been in the service two and one-half years and symptoms developed less than two months ago. Family history negative. Has complained of cough and has been gradually losing strength and weight. Examination shows signs at right apex and throughout left lower lobe. Temperature 99.4. Patient markedly emaciated; has racking cough and expectorates thick sputum, examination of which exhibits tubercle bacilli in great numbers.

HOSPITAL RECORD.

[Case paper No. 148, dated January 25, 1908.]

NATIONALITY.

Irish.

FAMILY HISTORY.

Grandparents: Negative. Father: Living, in good health, in seventieth year. Mother: Died of pneumonia. Two brothers: Living, good health. Three sisters: Living, good health.

PERSONAL HISTORY.

Born May 21, 1884, at Swan Creek, Nebr. Had no sickness before enlistment. Enlisted July 1, 1905, at Boston, Mass. Had syphilis in July, 1907; was transferred to Boston Hospital from the U. S. S. *Vermont;* improved and was sent back to duty on the U. S. S. *Wabash* in October, 1907. Present trouble commenced in October, 1907, while on the U. S. S. *Wabash*, with a cold in the head; two weeks later had a severe cold in the chest, with considerable cough and expectoration; about the 1st of November tubercle bacilli found in sputum and was transferred to Boston Hospital; had a very poor appetite; slept poorly; lost weight; did not improve; transferred to this hospital; received January 25, 1907.

HABITS.

Smokes a pipe very moderately. Is a very temperate consumer of alcoholic stimulants.

PRESENT CONDITION.

Feels fairly well; appetite only fair; sleeps well; bowels regular; coughs and expectorates in the evening. Height, 5 feet 5¾ inches; normal weight, 127; present weight, 105½; temperature, 95.6° to 103°; pulse, 88 to 130; respiration, 40; chest circumference, 31¼ inches; chest inflated, 31½ inches; chest deflated, 30 inches; chest expansion, 1½ inches.

Inspection.—Francke's striæ absent. Flat and elongated chest, both apices somewhat retracted. scapulæ prominent. Body emaciated, muscles soft.

Right lung, anteriorly.—Myotatic reflex present. Tactile fremitus increased to second rib. Dullness to second rib. Bronchial breathing to third rib, below which point expiration is prolonged. Vocal fremitus increased to third rib. Whispered pectoriloquy to third rib.

Right lung, posteriorly.—Tactile fremitus to fourth dorsal vertebra. Dullness general. Bronchial breathing to sixth dorsal vertebra, broncho vesicular to

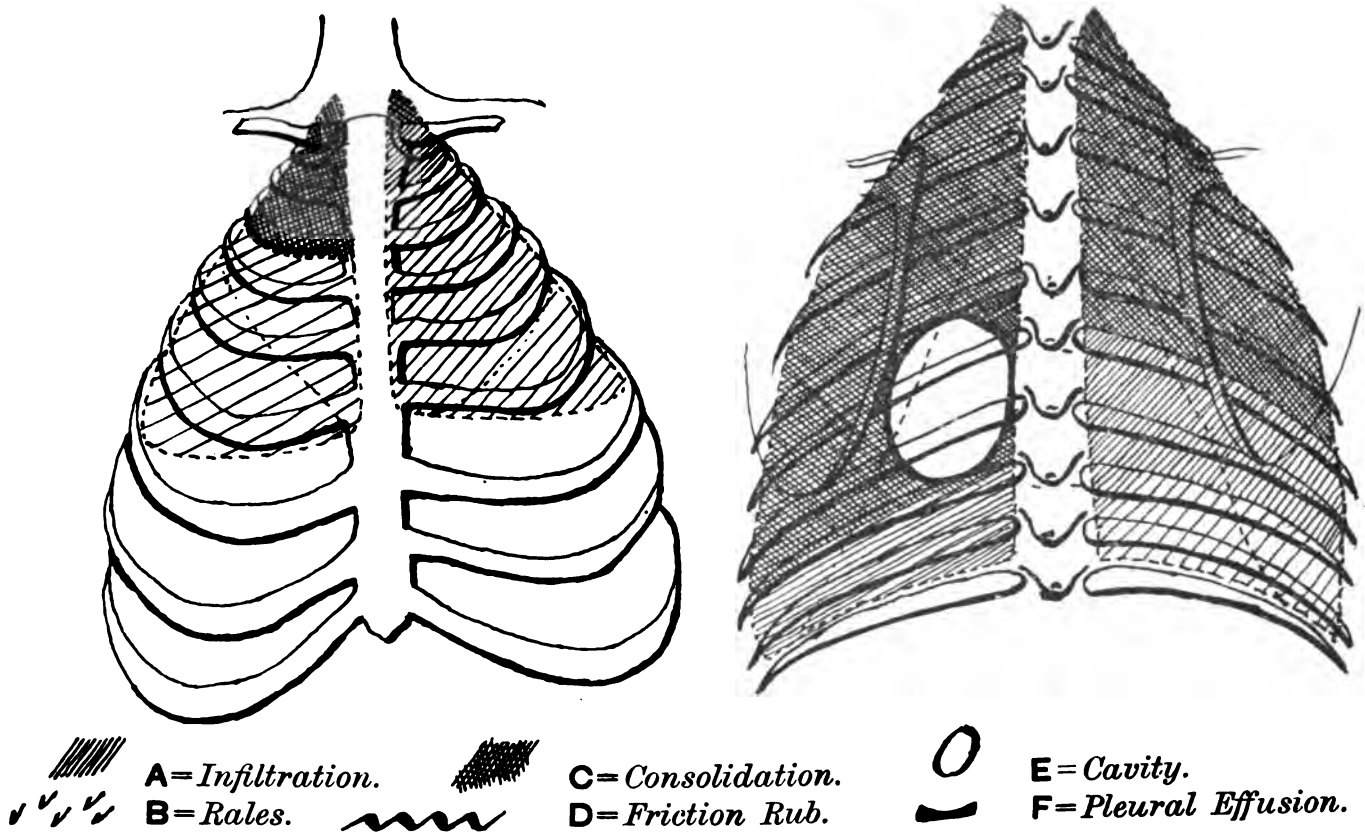


FIG. 5.—CHART SHOWING THE EXTENT AND CHARACTER OF THE PULMONARY LESIONS OF CASE 7 ON JANUARY 25, 1908.

eighth, prolonged expiration to base. Increased vocal fremitus to sixth dorsal vertebra, very pronounced over the bronchus. Whispered pectoriloquy to sixth dorsal vertebra.

Left lung, anteriorly.—Myotatic reflex present. Slight increase in tactile fremitus general. Dullness to second rib, below which point resonance is slightly impaired. Bronchial breathing to second rib, below which point expiration is prolonged. Vocal fremitus increased to second rib. Whispered pectoriloquy above the clavicle.

Left lung, posteriorly.—Tactile fremitus increased to sixth dorsal vertebra. Dullness general. Respiration generally suppressed, bronchial in character to the fifth dorsal vertebra, between the fifth and eighth dorsal vertebra an area of amphoric breathing, from the eighth to the base broncho-vesicular breathing. Moist rales from the first to the fifth dorsal vertebra. Increased vocal fremitus to the fifth dorsal vertebra, over the area inclosed between the fifth and the eighth and extending from the spine to the scapular edge vocal fremitus is markedly increased. Whispered pectoriloquy from the first to the fifth dorsal vertebra, over the area included between fifth and eighth the spinal column and scapular edge whispered pectoriloquy marked.

Other organs and tissues.—Heart: rapid, but otherwise normal; liver: normal; spleen: enlarged; kidneys: normal as to position; abdomen: normal; penis and appendages: apparently normal, other than a scar from an old chancre on the left side of penis about an inch from its origin; ischio rectal-fossa: normal; glandular system: inguinal glands very much enlarged, cervical glands enlarged; arterial system: normal.

Complication.—Secondary syphilis (1907).

Pulmonary summary.—Consolidation of right lung, anteriorly, down to third rib, below which point the lung is slightly infiltrated. Consolidation of right lung, posteriorly, down to sixth dorsal vertebra, from which point to the eighth dorsal vertebra it is profoundly infiltrated; from the eighth to the tenth dorsal vertebra it is moderately infiltrated. Consolidation of left apex, anteriorly, profound infiltration from clavicle to second rib, below which point the lung is moderately infiltrated. Active consolidation of left lung, posteriorly, down to eighth dorsal vertebra, with a large cavity area extending from the fifth to the eighth dorsal vertebra, and from the spine to the scapular border; from the eighth dorsal vertebra to the base, the lung is profoundly infiltrated.

Clinical Notes Taken from Case Papers.

February 1: Injections of mercury begun.

February 27: Improving. Injection discontinued because of pains they produce. Drug given by mouth.

(Physical examination report, being the result of the second examination made May 12, 1908.)

PRESENT CONDITION.

Feels well; appetite fair; sleeps well; bowels regular. Does not cough much except at night upon going to bed; expectorates very little. Has not had

night sweats for about three weeks. Temperature, 97° to 100°; pulse, 80 to 130; respiration, 24; chest circumference, 32½ inches; chest inflated, 32¾ inches; chest deflated, 29½ inches; chest expansion, 3¼ inches; weight, 122.

Inspection.—Chest elongated and flattened in superior quadrant. No retraction of apices. Right shoulder droops slightly. Scapulæ slightly prominent. Blue striæ of Francke present over sides. Body nourishment fairly good. Muscles soft.

Right lung, anteriorly.—Myotatic reflex present. Slight increase in tactile fremitus to second rib. Bronchial breathing to second rib; from this point to fourth, prolonged expiration, below which point respiration is slightly suppressed. Increased vocal fremitus to second rib. Whispered pectoriloquy to second rib.

Right lung, posteriorly.—Slight increase in tactile fremitus to sixth dorsal vertebra. Dullness to fourth dorsal vertebra. Bronchial breathing to fifth dorsal vertebra; from this point to eighth prolonged expiration, below which point respiration is slightly suppressed. Vocal fremitus to sixth dorsal vertebra. Whispered pectoriloquy to fifth dorsal vertebra.

Left lung, anteriorly.—Myotatic reflex present. Tactile fremitus negative. Very slight dullness to second rib; slightly prolonged expiration to third, below which point respiration is slightly suppressed. Very slight increase in vocal fremitus above clavicle. Very slight whispered pectoriloquy above clavicle.

Left lung, posteriorly.—Slight increase in tactile fremitus to fourth dorsal vertebra. Slight dullness to second dorsal vertebra. Broncho-vesicular breathing to third dorsal vertebra; from this point to the eighth expiration is prolonged. Vocal fremitus increased to fourth dorsal vertebra. Opposite eighth dorsal vertebra an area about the size of a silver dollar gives increased vocal fremitus. Whispered pectoriloquy to third dorsal vertebra; from third to seventh dorsal vertebra this is slight. Opposite the eighth dorsal vertebra an area about the size of a silver dollar gives more pronounced whispered pectoriloquy.

Other organs and tissues.—Heart: normal; liver: slightly enlarged downward; spleen: enlarged; kidneys: normal as to position; abdomen: normal; penis and appendages: old syphilitic chancre scar, otherwise normal; ischio-rectal fossa: normal; glandular system: inguinal and upper chain of anterior cervical glands enlarged; arterial system: normal.

Pulmonary summary.—Consolidation of right lung, anteriorly, down to second rib, from which point to the fourth rib the lung is infiltrated. Consolidation of right lung, posteriorly, down to fifth dorsal vertebra, from which point to the eighth dorsal vertebra the lung is infiltrated. Profound infiltration of left apex; from the clavicle to third rib the lung is infiltrated. Consolidation of left lung, posteriorly, down to third dorsal vertebra; the remainder of the lung is profoundly infiltrated, with the exception of an area about 2 inches in diameter opposite the eighth dorsal vertebra, which is densely fibrotic.

(Clinical notes taken from case paper.)

April 23, administration of mercury by mouth was stopped, because it was deranging the gastro-intestinal tract.

May 14, considerably improved. Weight, 126 pounds.

May 18, administration of mercury by injection resumed.

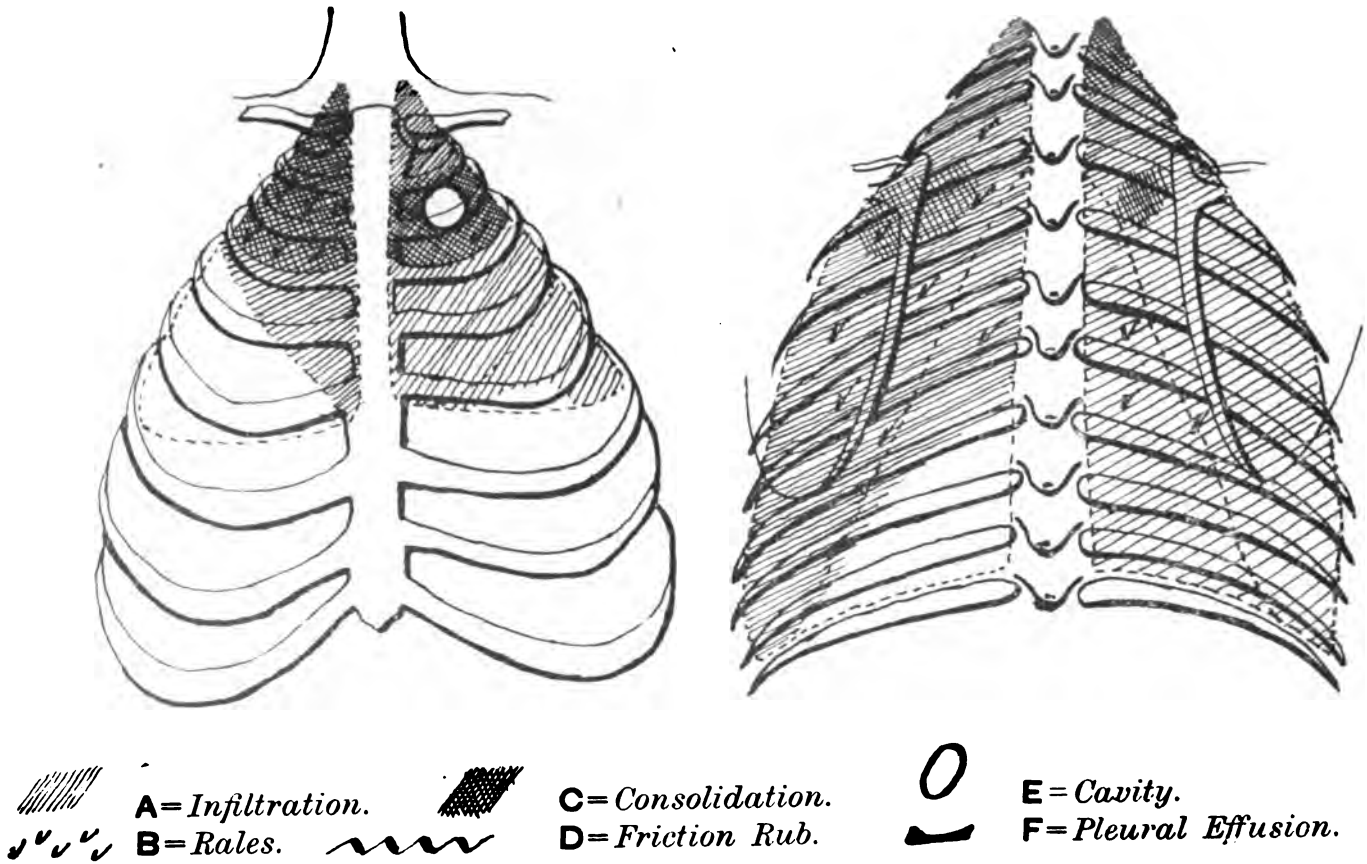
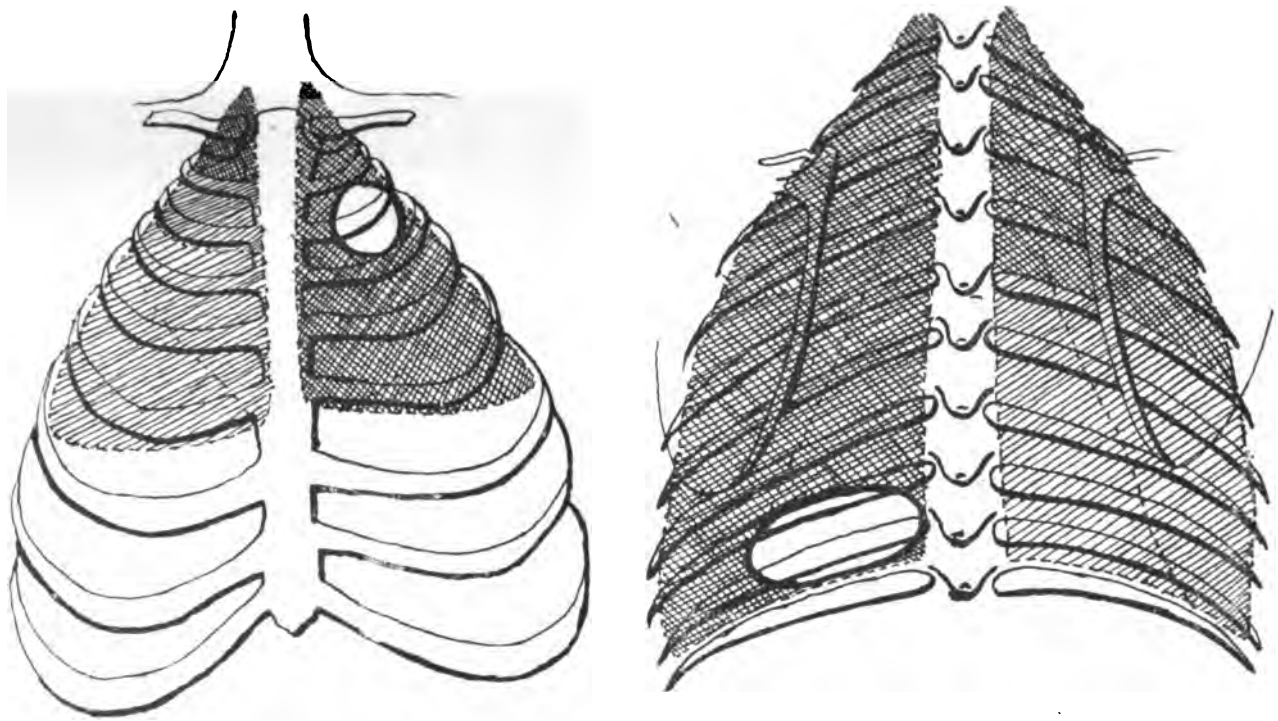


FIG. 7.—CHART SHOWING THE EXTENT AND CHARACTER OF THE PULMONARY LESIONS IN CASE 8 ON AUGUST 5, 1907.



A = *Infiltration.*
B = *Rales.*
C = *Consolidation.*
D = *Friction Rub.*
E = *Cavity.*
F = *Pleural Effusion.*

FIG. 8.—CHART SHOWING THE PROGRESSIVE INCREASE IN THE PULMONARY LESIONS IN CASE 8 ON FEBRUARY 18, 1908.

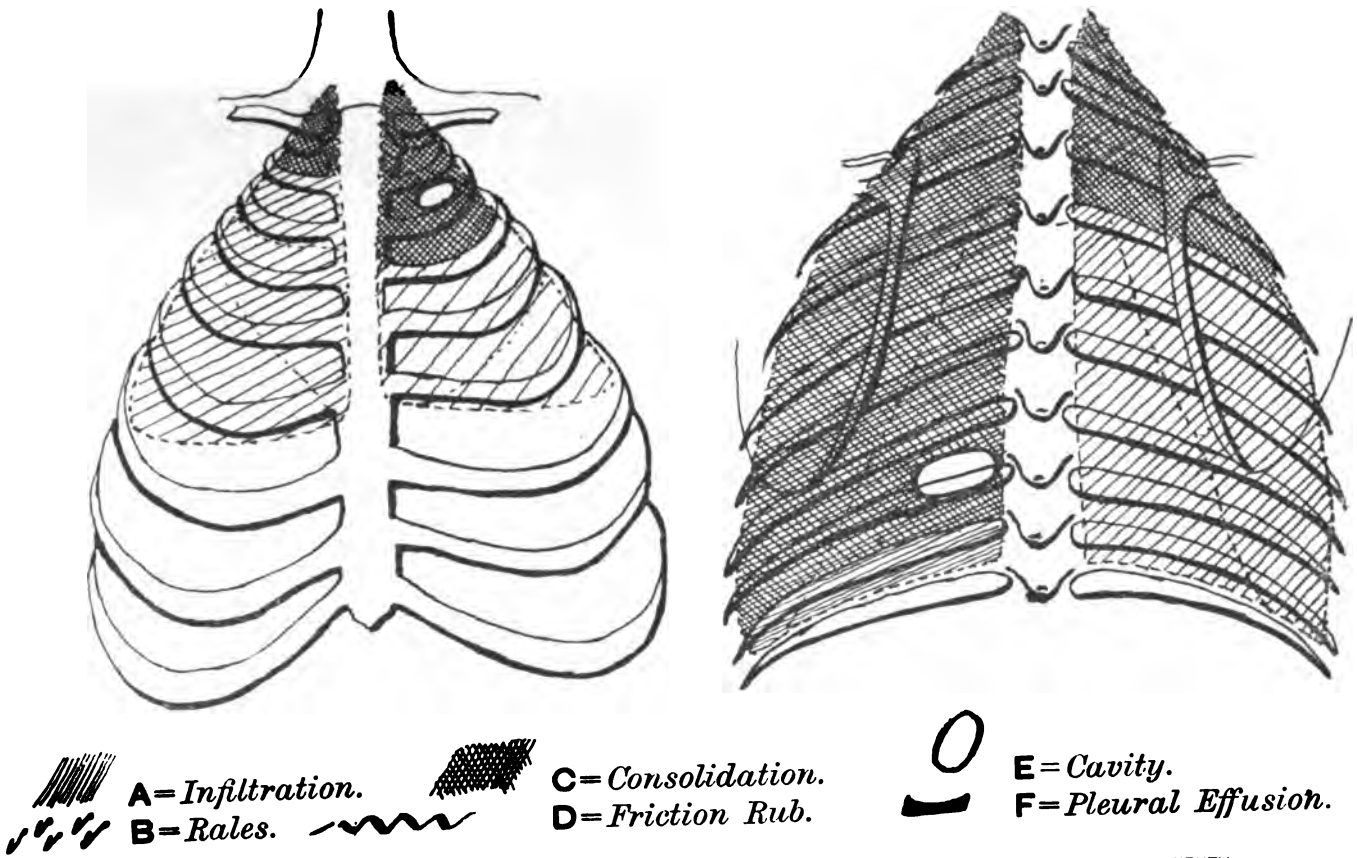


FIG 9.—CHART SHOWING MARKED IMPROVEMENT IN THE PULMONARY LESIONS OF CASE 8 ON MAY 9, 1908, TWO MONTHS AND TWENTY-THREE DAYS AFTER BEING PLACED ON MERCURY.

Plates 5 and 6 illustrate the decided pulmonary improvement produced by mercury in this case.

Case No. 8: S—— J——, ordinary seaman, U. S. Navy. American, of Irish descent. Brunette.

(Abstract from hospital ticket, dated Naval Hospital, Pensacola, Fla., July 30, 1907.)

Origin: There is no evidence that it was in the line of duty, the facts being as follows, viz: The predisposition, if not the disease itself, existed prior to enlistment. Two brothers died of tuberculosis. He has always been subject to coughs and colds. Involvement, both lungs—more extensive in left side. Has been under treatment since June 20, 1906. Has lost 23 pounds since admission. Sputum examinations have always been positive for tubercle bacillus.

HOSPITAL RECORD.

(Case paper No. 30, dated July 30, 1907.)

FAMILY HISTORY.

Knows nothing about grandparents, except father's father, who died at the age of 102 (accidental death). Has four brothers all in good health, and two sisters. Two brothers died of tuberculosis at 30 and 27.

PERSONAL HISTORY.

During childhood had measles and mumps; no other sickness until after enlistment. Enlisted November 7, 1904. Born February 6, 1883, at Bloomington, Ill. Had malaria on *Missouri* in July, 1905, otherwise no sickness until March, when in Guantanamo. Severe pains in chest. Was on sick list two weeks in March, 1906, with tuberculosis; was then sent north to New York hospital, where he arrived April 1, 1906. Weight on enlistment was 122 pounds. Weighed on *Missouri* about 140. Left New York June 6 for Pensacola, where he remained till transferred here.

HABITS.

Smokes pipe a good deal. Drinks very moderately.

PRESENT CONDITION.

Has had no night sweats. Sleeps and eats well. Temperature is very variable, often running from subnormal to 102° in a few hours. The finger nails are hypertrophied and are typical of a tubercular case of long standing. In my opinion this man ought never to have been accepted for enlistment. He was undoubtedly a chronic tubercular case long before 1904.

Inspection.—Marked cardiac impulse in the 3, 4, 5, and 6 intercostal spaces. Sternum flattened. Marked depressions above and below clavicles. Body nourishment poor. Musculature poor. Protruding left scapula; depressed right. Typical chest of old chronic case: Chest normal, 31½; chest deflated, 30½; chest inflated, 33½; chest mean, 32 inches; weight 108½ pounds; height, 5 feet 9 inches.

Right lung, anteriorly.—Myotatic reflexes present. Tactile fremitus increased (upper quadrant especially). Apex: Decided dullness; nonresonance over entire lung area. Amphoric breathing apex; bronchal breathing to nipple; broncho-vesicular below. From clavicle to nipple whistling râles. Vocal fremitus markedly increased from apex to second intercostal space. Cavity under clavicle, diameter situated anteriorly.

Right lung, posteriorly.—Tactile fremitus markedly increased over entire area. Dullness to tenth dorsal. Cogwheel bronchial breathing to level second dorsal. Below this point bronchial in character with numerous moist whistling râles.

Left lung, anteriorly.—Myotatic reflexes present. Tactile fremitus increased over entire lung. Apex: Slight dullness but considerable retraction. Breath sounds are high pitched to fourth intercostal space—probably emphysematous condition. Amphoric breathing from second to fourth intercostal space and from the sternum to mid axillary line. Cavity 2-inch circumference just above nipple.

Left lung, posteriorly.—Tactile fremitus slightly increased. Dullness on percussion to seventh dorsal. Voice sounds increased. Bronchial breathing over whole area. Scattered râles.

Heart: Moderate aortic stenosis; aneurism of left internal mammary in intercostal space.

Pulmonary summary.—Right lung consolidated at apex; small cavity below clavicle in nipple line. Middle lobe infiltrated. Active process extends as far as nipple. Apex of left lung retracted. Cavity size of fist above nipple, surrounded by area of consolidation: upper half lower lobe infiltrated. Very little activity in this lung. (See plate 7.)

CLINICAL NOTES TAKEN FROM CASE PAPER.

August 2: Unfavorable case. Weight, 108.

Not in line of duty according to accompanying hospital ticket, and from physical examination and history condition must have existed many years prior to his enlistment.

December 21: Patient has been in bed a week, following slight hemorrhage. See physical examination December 18, 1907.

January 2: The same.

January 13: Two days ago patient's face was swollen in a. m. Peripheral circulation poor. Examination of urine shows a large amount of albumen present. Digitalis ♏ v. t. i. d. Basham's mixt. ℥ ss t. i. d.

January 15: Slight improvement in condition of urine. 950 c. c. increased to 1,150 c. c.

January 19: About the same.

February 2: Patient's heart and kidneys slightly improved in action, but pulmonary condition not improved.

February 12: The same. Peripheral circulation poor. Basham's mixture discontinued.

A thorough physical examination was made February 18, 1908: Temperature, 96 to 99.2; pulse, 80 to 115; respiration, 28; chest circumference, 31 inches; chest inflated, 32½ inches; chest deflated, 30¼ inches; chest expansion, 2¼ inches; weight, 111½.

A chart of the pulmonary involvement found at this time is given on plate 8; comparing this with plate 7, the progressive increase of involvement since date of admission will be seen.

February 19: Placed upon mercury by injection.

February 26: Patient again shows œdema of face and extremities. Basham's mixture resumed.

February 27: Enormous quantities of urine passed during two hours. Condition improved temporarily.

March 3: Basham's mixture discontinued; general condition the same.

March 4: Purulent discharge from penis, left inguinal glands enlarged.

March 8: Rectal examination shows left side of prostate almost gone, right enlarged but not tender. Patient not doing well.

March 12: A swelling above right groin, deep. Probably abscess from prostate, burrowing, or Psoas abscess.

(Physical examination report, being the result of examination made May 9, 1908.)

PRESENT CONDITION.

Feels fine, appetite excellent, sleeps well, bowels regular. Coughs very little, except upon arising. Expectorates very little. No pains in chest. Weight, 115; temperature, 96 to 99; pulse, 80 to 120; respiration, 28; chest circumference, 31 inches; chest inflated, 32¾ inches; chest deflated, 30¼ inches; chest expansion, 2½ inches.

Inspection.—Chest elongated and flattened, left chest is sunken from clavicle to sixth rib. Left shoulder droops. Very slight motion on left side. Cardiac pulsation is diffused on left side from third to fifth rib. Both apices retracted. Blue striae of Francke over both sides. Dorsal vertebra posterior curvature. Scapulæ very prominent.

Right lung anteriorly.—Myotatic reflex present. Slight increase in tactile fremitus to second rib. No dullness. Bronchial breathing general. Marked increase in vocal fremitus to second rib, below which point it is increased. Whispered pectoriloquy to second rib.

Right lung, posteriorly.—Slight dullness general. Tactile fremitus negative. Bronchial breathing to fifth dorsal vertebra, below which point it is bronchovesicular. Vocal fremitus increased generally; this is more marked down to fifth dorsal vertebra. Whispered pectoriloquy to fourth dorsal vertebra.

Left lung, anteriorly.—Myotatic reflex present. Tactile fremitus increased to fourth rib. Dullness general. Bronchial breathing to second rib, from second to fourth rib, amphoric breathing, below which point respiration is suppressed. An area in second interspace extending about 1½ inches on either side of nipple line, gives bleating; below this point no increase in vocal fremitus can be detected. Whispered pectoriloquy to second rib and very pronounced in second interspace running from nipple line to about 1½ inches on outside of it.

Left lung, posteriorly.—Slight increase in tactile fremitus to eighth dorsal vertebra. Slight dullness general. Bronchial breathing general. Increase in vocal fremitus general; this is pronounced at scapular edges opposite eighth dorsal vertebra, over an area of about 2 by 3 inches. Whispered pectoriloquy down to ninth dorsal vertebra.

Other organs and tissues.—Heart, normal; liver, enlarged downward; spleen, normal; kidneys, normal as to position; abdomen, normal; penis and appendages, normal; ischio-rectal fossa, normal; glandular system, normal; arterial system, normal; prostate, about normal.

Pulmonary summary.—Consolidation of right lung, anteriorly, down to second rib, below which point the lung is infiltrated. Consolidation of right lung, posteriorly, down to fourth dorsal vertebra, below which point it is infiltrated. Consolidation of left lung, anteriorly, down to fourth rib, with cavity area in second interspace, extending outward from nipple line for 1½ inches. Below the fourth rib the lung is very lightly infiltrated. Consolidation of left lung, pos-

teriorly, down to ninth dorsal vertebra, with cavity area opposite eighth dorsal vertebra. From the ninth to tenth dorsal vertebra the lung is infiltrated.

For chart of pulmonary involvement at this time see plate 9, which will illustrate the amount of pulmonary improvement since starting mercury on February 19.

May 21: Weight, 113 pounds.

Case No. 9: W. K. J., warrant officer steward, U S. Navy. Japanese.

HOSPITAL RECORD.

(Case paper No. 95, dated October 10, 1907.)

FAMILY HISTORY.

Born in Japan in 1879. Grandparents: Negative. Father: Living, good health. Mother: Living, good health. Brothers: None. Sisters: One, living and healthy.

PERSONAL HISTORY.

According to patient's statement he had never been sick during childhood or early manhood. Enlisted in October, 1905. On December 28, 1906, while on board the U. S. S. *Columbia*, in Cuba, first noticed a cold on the chest; cough and sore throat. These symptoms continued until March 1, when he went on sick list. On March 16 was sent to naval hospital at Norfolk, Va. Remained there until his transfer here on October 10.

PRESENT CONDITION.

Weight, 114½; chest circumference, 33; chest inflated, 34; chest deflated, —. Patient states that he has lost 13 pounds since present trouble began. There is considerable cough and expectoration. Appetite fair, sleeps well, bowels regular. Does not use alcohol or tobacco. Temperature normal, pulse 112, respiration 24. He has a left tubercular epidydimitis and a right and left ischio-rectal fistula for which operation has been unsuccessfully performed.

Plates 10 and 11 illustrate the progressive involvement of the lungs between the date of admission and January 13, 1908.

April 1. Injections of mercury begun.

April 29. Physical examination was made.

Plate No. 12 shows the extent of pulmonary involvement found at this examination, and by comparing it with plates 10 and 11 the improvement in the pulmonary condition since April 1, when the first injection of mercury was given, is apparent; the left epidydimus is much less hard, is smaller, and not tender.

May 21, patient is still improving. Ten examinations of the sputum made on succeeding days failed to show presence of the tubercle bacillus.

Weight, 120½ pounds. Gained since admission 6 pounds.

The following cases of uncomplicated pulmonary tuberculosis are reported, showing the marked improvement produced by the administration of mercury:

Case No. 10: S. E. S., midshipman, U. S. Navy.

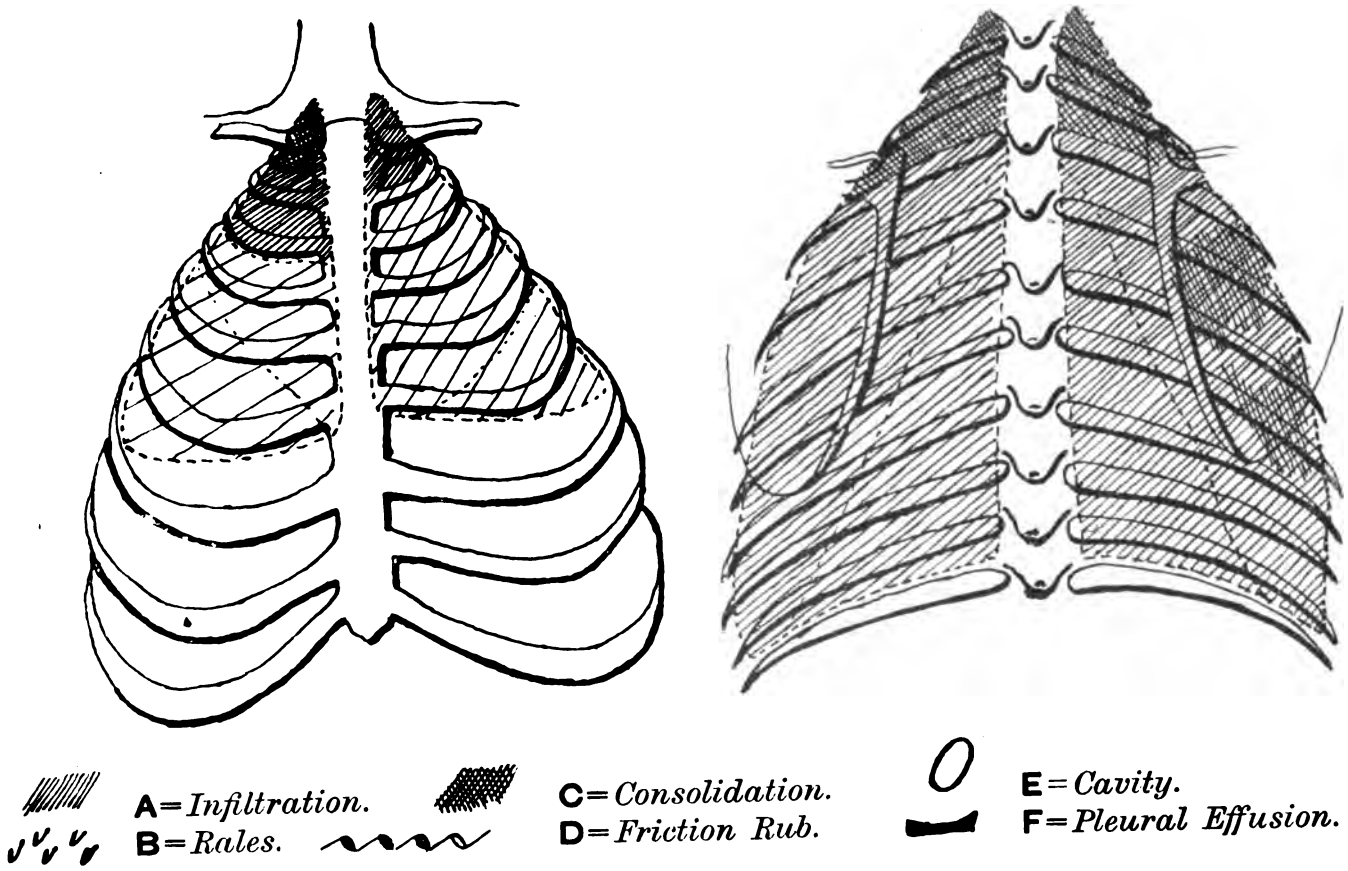


FIG. 10.—CHART SHOWING THE EXTENT AND CHARACTER OF THE PULMONARY LESIONS IN CASE 9 ON OCTOBER 10, 1907.

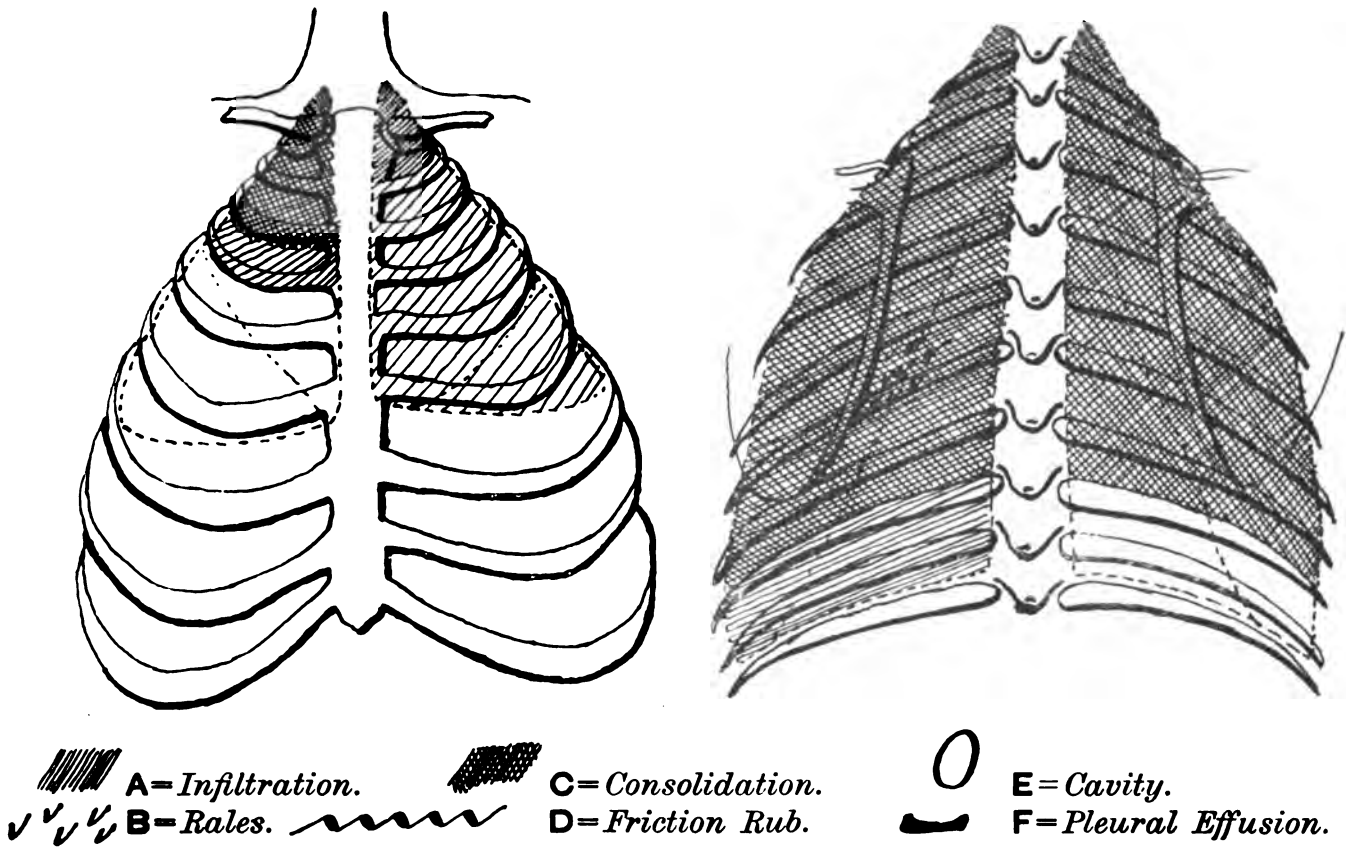


FIG. 11 —CHART SHOWING THE PROGRESSIVE INCREASE IN THE PULMONARY LESIONS IN CASE 9 ON JANUARY 13, 1908.

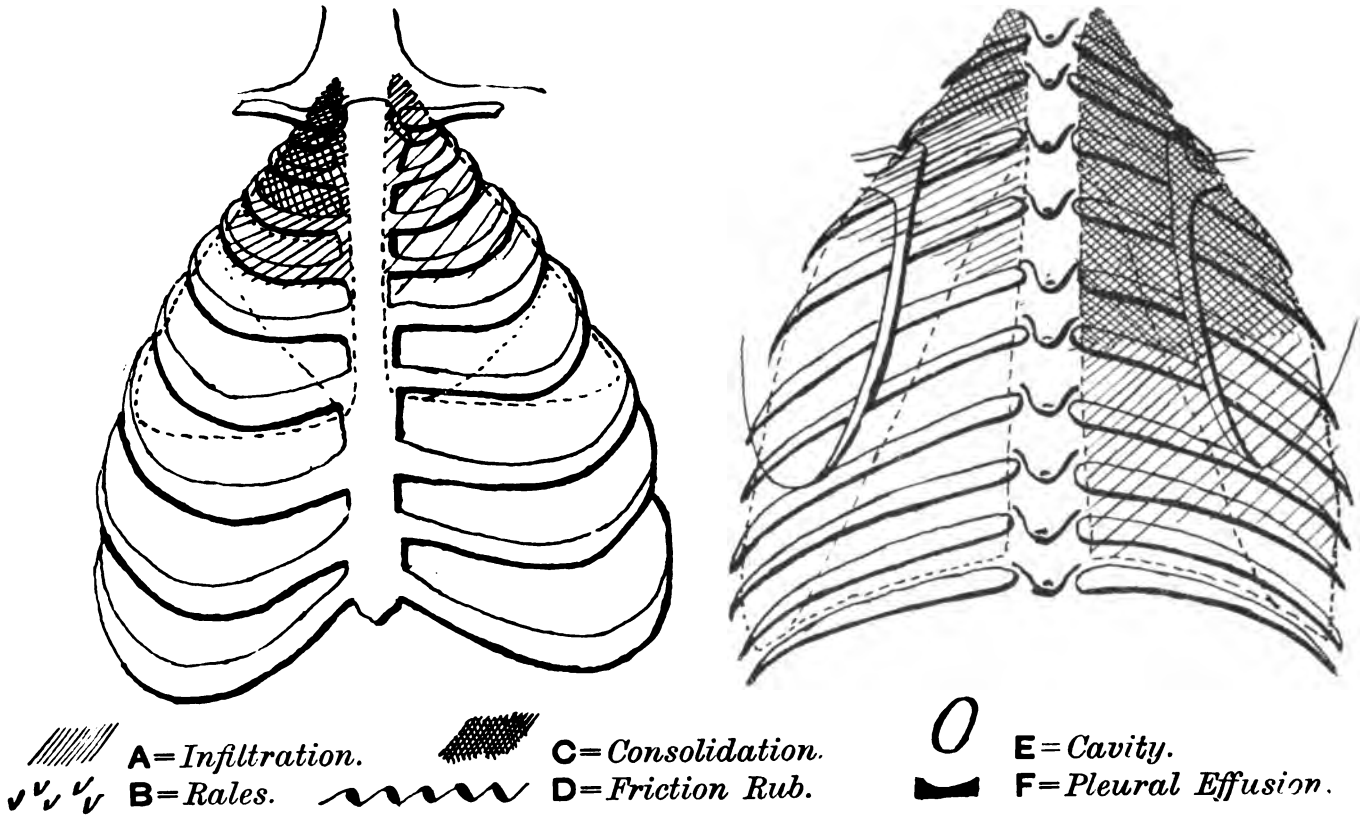


FIG. 12.—CHART SHOWING THE MARKED IMPROVEMENT IN THE PULMONARY LESIONS IN CASE 9 ON APRIL 29, 1908, TWENTY-NINE DAYS AFTER BEING PLACED ON MERCURY

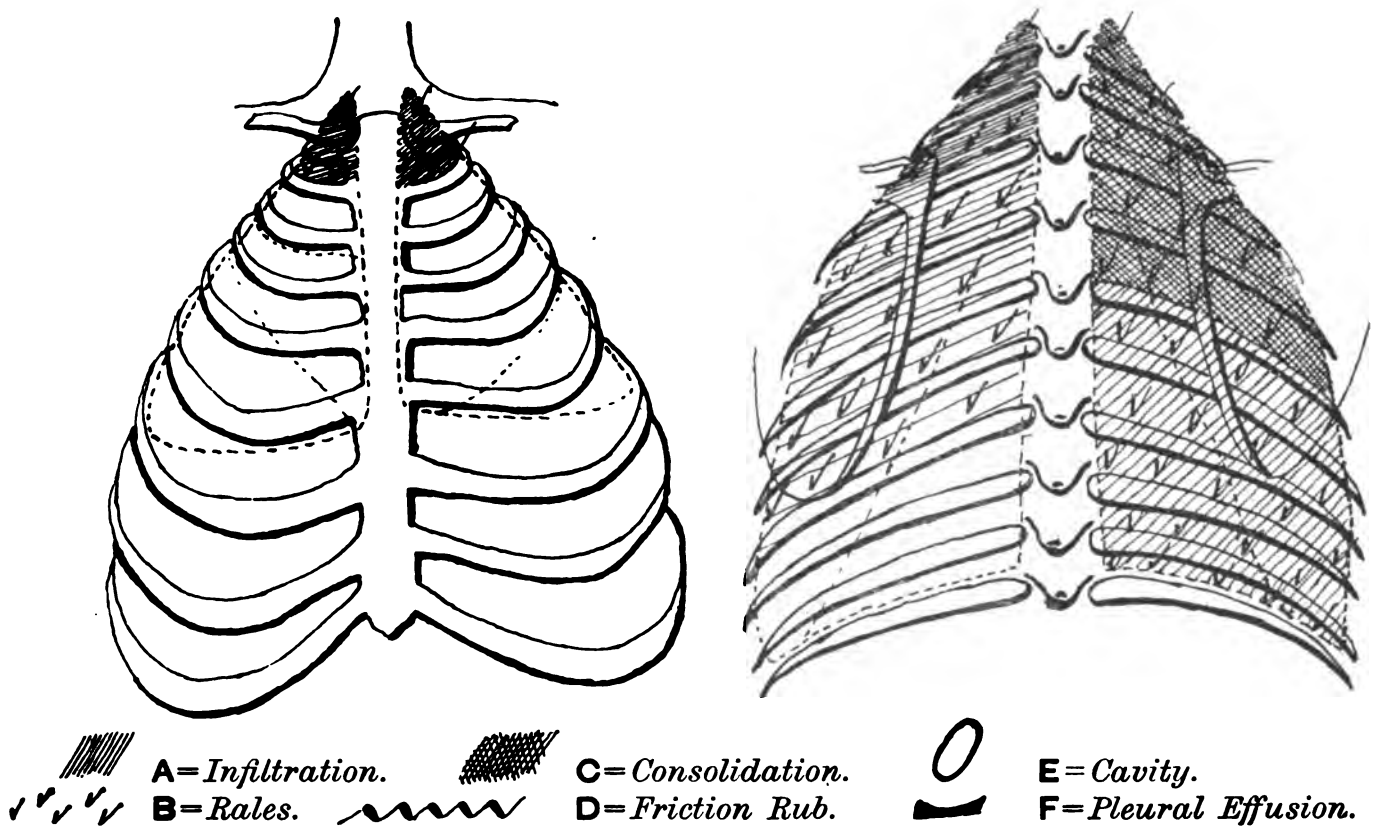


FIG. 13.—CHART SHOWING EXTENT AND CHARACTER OF THE PULMONARY LESIONS IN CASE 10 ON MARCH 17, 1908.

Hospital Record.

(Case paper No. 109, dated March 16, 1908.)

NATIONALITY.

Paternal grandparents: Scotch. Maternal grandparents: English.

FAMILY HISTORY.

Paternal grandfather: Died in fiftieth year; civil war effects. Paternal grandmother: Negative. Maternal grandfather: Died in seventy-second year; heart trouble. Maternal grandmother: Living, in excellent health, in eighty-second year. Father: Died in fifty-third year, heart trouble. Mother: Died in thirty-ninth year, heart trouble. One brother: Living, in good health. One sister: Living, in good health.

PERSONAL HISTORY.

Born March 1, 1890, at Brooklyn, N. Y. Childhood diseases: Measles, tonsilitis, and bronchitis, when about 7 years old; no other sickness until the present time. Appointed to the U. S. Naval Academy September, 1906. Present trouble commenced in December, 1907, while at the Naval Academy, with la grippe; was on the sick list for four days; after leaving the hospital continued to have a bad cough and a nightly fever; went on the sick list again on January 10; transferred to the naval hospital at Annapolis, and was treated for bronchitis until February 10; went back to duty for three days and then placed on the sick list again with a temperature of 102. Sputum was examined about February 20 and tubercle bacilli were found to be present. Transferred to this hospital; received March 16, 1908.

HABITS.

Does not smoke or drink.

PRESENT CONDITION.

Feels very well. Appetite fair, sleeps well, bowels regular. Coughs and expectorates very little in the mornings. Has a slight hoarseness. Height, 5 feet 9¾ inches; normal weight, 150; present weight, 131½; temperature, 98.6 to 101.6°; pulse, 128; respiration, 16; chest circumference, 34 inches; chest inflated, 35½ inches; chest deflated, 31¾ inches; chest expansion, 3¾ inches.

Inspection.—Faint red striæ of Francke over right side. Chest elongated and somewhat flattened on left side; left apex retracted. Body somewhat thin, muscles hard.

Right lung, anteriorly.—Myotatic reflex absent. Tactile fremitus negative. Percussion negative. Respiration somewhat suppressed generally; expiration prolonged to second rib. A few moist râles down to the second rib. Slight increase in vocal fremitus above the clavicle. Whispered pectoriloquy above the clavicle.

Right lung, posteriorly.—Tactile fremitus negative. Percussion negative. Broncho-vesicular breathing to fourth dorsal vertebra, below which point expiration is prolonged. Scattered moist râles general. Vocal fremitus slightly increased to fifth dorsal vertebra. Whispered pectoriloquy to fifth dorsal vertebra.

Left lung, anteriorly.—Myotatic reflex absent. Tactile fremitus negative. Slight dullness to second rib. Broncho-vesicular breathing to second rib. A

few moist râles to second rib. No increase in vocal fremitus. Slight whispered pectoriloquy above the clavicle.

Left lung, posteriorly.—Tactile fremitus negative. Percussion negative. Prolonged expiration and scattered moist râles to seventh dorsal vertebra. Vocal fremitus negative. Slight whispered pectoriloquy to third dorsal vertebra.

Other organs and tissues.—Heart, normal; liver, normal; spleen, normal; kidneys, normal as to position; abdomen, normal; penis and appendages, normal; ischiorectal fossa, a sinus on right side; glandular system, normal; arterial system, normal.

Pulmonary summary.—Active consolidation of right apex, anteriorly; from the clavicle to second rib active infiltration.

Active consolidation of right lung, posteriorly, down to fifth dorsal vertebra, below which point the lung is actively infiltrated. Profound active infiltration of left lung, anteriorly, down to second rib. Rather profound active infiltration of left lung, posteriorly, down to third dorsal vertebra; from this point to the seventh dorsal vertebra it is actively moderately infiltrated. See Plate 13.

March 18, injections of mercury commenced.

(Physical examination report, being the result of the second examination, made May 12, 1908.)

PRESENT CONDITION.

Feels fine, appetite good, sleeps well, bowels regular. Coughs very little except upon arising; expectorates very little except upon arising. Temperature, 98 to 98.8°; pulse, 72 to 100; respiration, 12; chest circumference, 36⅛ inches; chest inflated, 38⅛ inches; chest deflated, 33½ inches; chest expansion, 4⅝ inches; weight, 151.

Inspection.—Well-formed chest, slightly flattened in superior quadrant. No retraction of apices. Body nourishment good. Muscles hard. Red striæ of Francke very slight over both sides. Right shoulder droops slightly.

Pulmonary summary.—Profound infiltration of right apex, anteriorly; from the clavicle to second rib the lung is infiltrated. Consolidation of right lung, posteriorly, down to second dorsal vertebra, from which point to the sixth dorsal vertebra the lung is slightly infiltrated. Consolidation of left apex, anteriorly; from the clavicle to second rib the lung is infiltrated. Infiltration of left lung, posteriorly, down to first dorsal vertebra. Bronchiectasis of left bronchus down to second dorsal vertebra.

Plate 14 illustrates the condition; comparing this with plate 13 will show rapid pulmonary improvement since starting mercury on March 18. The small sinus noted in the ischiorectal fossa on admission is healed.

May 14. Weight 152 pounds, a gain of 20½ pounds in less than two months.

Case No. 11: T. W. H., ordinary seaman.

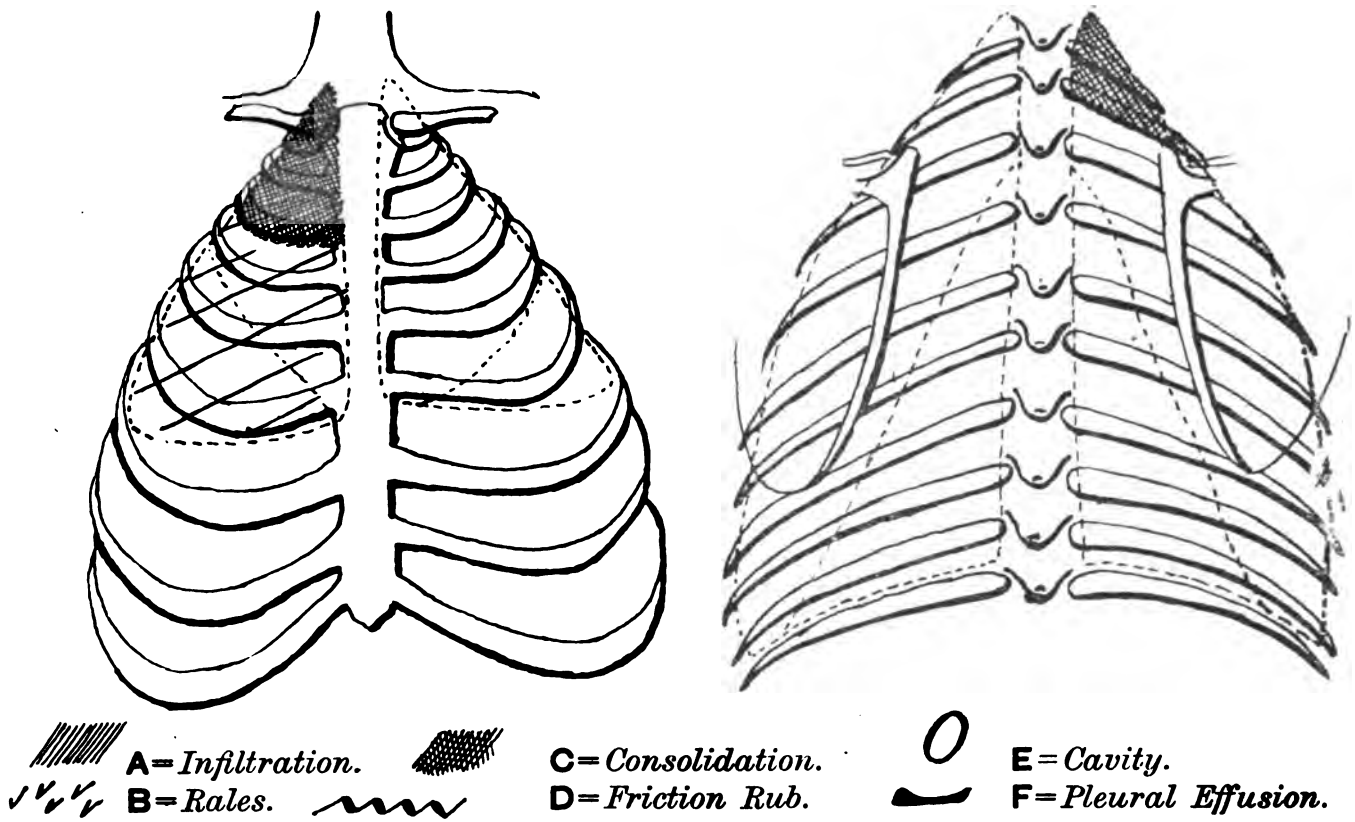


FIG. 15.—CHART SHOWING THE EXTENT AND CHARACTER OF THE PULMONARY LESIONS IN CASE 11 ON SEPTEMBER 4, 1907.

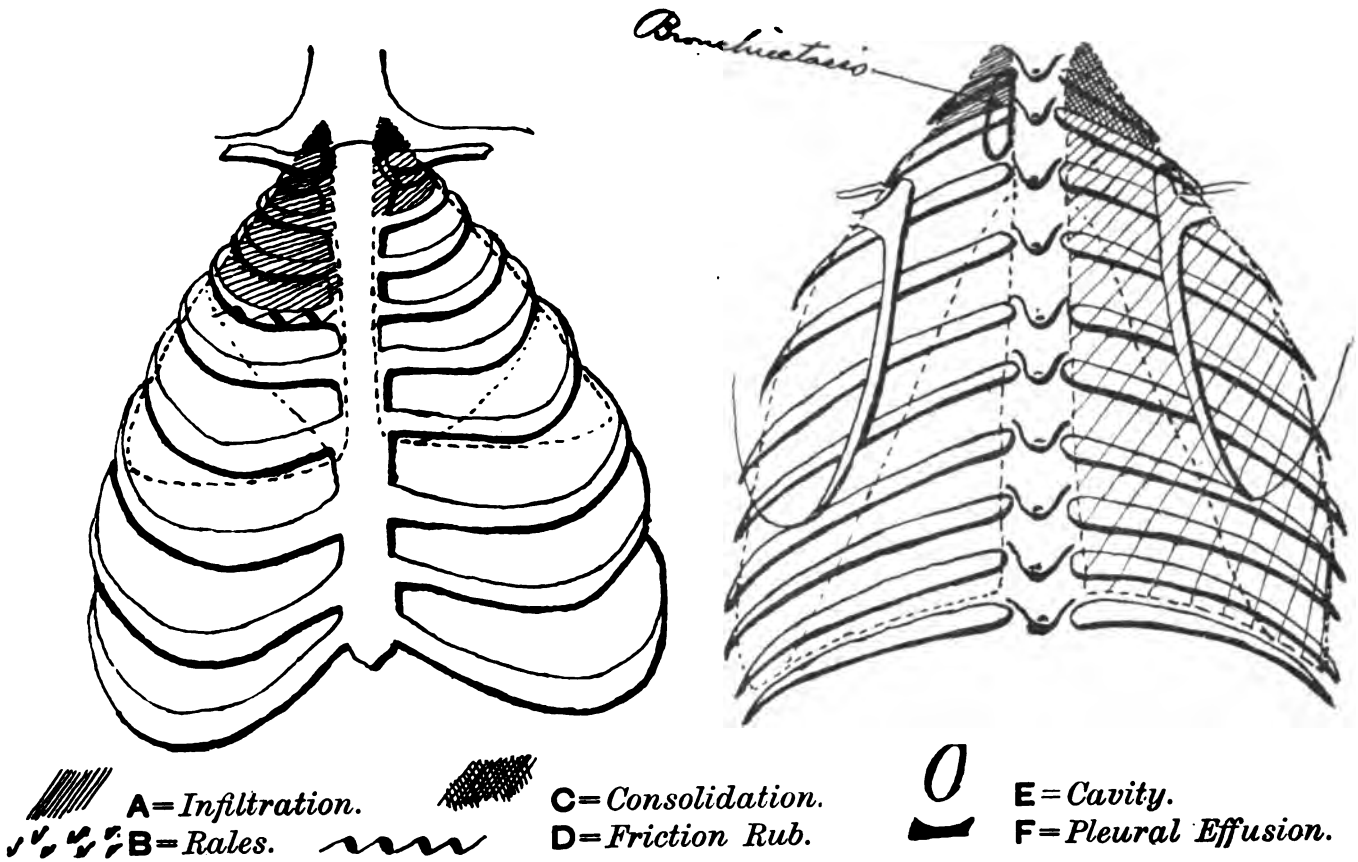


FIG. 16.—CHART SHOWING THE INCREASE IN THE PULMONARY LESIONS OF CASE 11 ON DECEMBER 27, 1907.

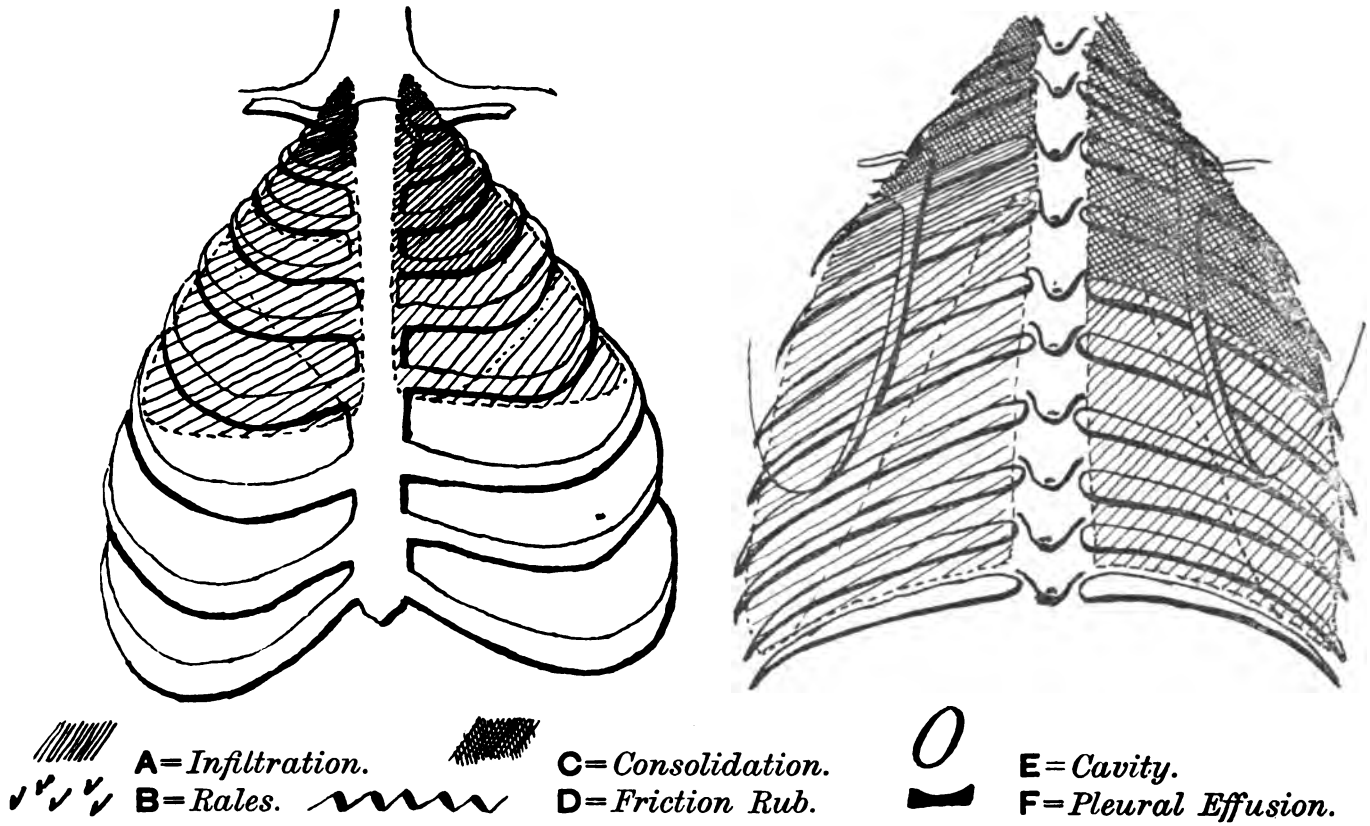


FIG. 17.—CHART SHOWING THE PROGRESSIVE INCREASE IN THE PULMONARY LESIONS IN CASE 11 ON MARCH 3, 1908.

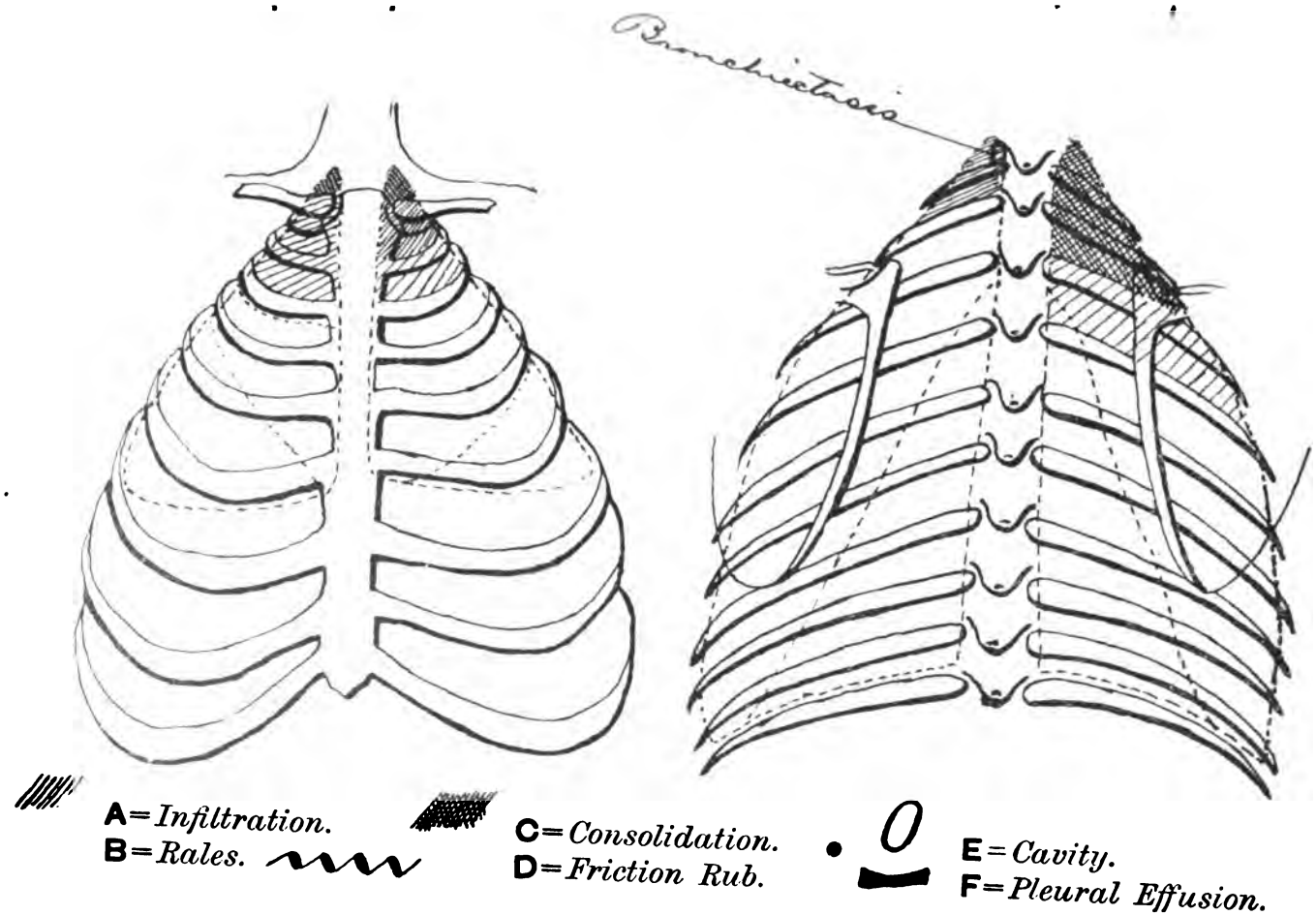


FIG. 18.—CHART SHOWING THE MARKED IMPROVEMENT IN THE PULMONARY LESIONS IN CASE 11 ON APRIL 29, 1908, HAVING BEEN ON MERCURY LESS THAN TWO MONTHS.

HOSPITAL RECORD.

(Case paper No. 51, dated August 31, 1907.)

FAMILY HISTORY.

Mother, two sisters, and one brother died of consumption.

Plates 15, 16, and 17 illustrate increasing pulmonary involvement, as shown by physical examination made on the following dates, respectively: September 4, 1907; December 27, 1907, and March 3, 1908.

March 4. Placed on mercury by injection.

April 29, 1908. He stated his present condition as follows: "Feel well, appetite fair, sleep well, bowels regular. Have a slight cough, but considerable expectoration."

Ten examinations of the sputum made on succeeding days failed to reveal the tubercle bacillus.

Plate No. 18, made April 29, 1908, shows the pulmonary condition on that date. Comparing this with plate 17 shows the marked improvement in the pulmonary involvement.

May 9, 1908. Discharged from treatment and the service as not amenable to further treatment, because of habits prejudicial to his health and the discipline of this hospital.

Case No. 12: K. E. T., yeoman, third class, U. S. Navy.

HOSPITAL RECORD.

(Case paper No. 81, dated September 18, 1907.)

FAMILY HISTORY.

Paternal grandfather died at 78, of rheumatism. Paternal grandmother living at 82; good health. Maternal grandfather living at 76; good health. Maternal grandmother living at 72; good health. Father living at 49; good health. Mother died at 25, of typhoid fever. One brother living; good health.

PERSONAL HISTORY.

Born at Troy, Ind., March 9, 1888. Never had a day's illness until the present trouble. Enlisted at Springfield, Ill., March 9, 1905. While on the U. S. S. *Kearsarge*, at Provincetown, August, 1907, just after leaving Hampton Roads, where the ship had been all summer, patient first noticed a cough. After several days' treatment cough was no better and patient had pain in chest and lost weight. Was put to bed and transferred to Norfolk Hospital, August 23. While at Norfolk patient improved and gained weight. Transferred to naval hospital, New Fort Lyon, where he was received September 18, 1907.

PRESENT CONDITION.

Appetite good, sleeps well, feels strong and healthy. Coughs slightly in the morning, with little expectoration. Slight pain in left lung. Weight, 115½; height, 5 feet 5½ inches; chest inflated, 32; deflated, 29½; expansion, 2½ inches. Pulse 110, temperature and respiration normal.

Plate No. 19 will show the extent of pulmonary involvement at this time. The third physical examination, January 11, 1908, showed considerable increase in the pulmonary involvement. This is shown by plate No. 20.

March 2. Injections of mercury commenced.

May 11, 1908. Fourth physical examination as follows:

PRESENT CONDITION.

Feels well, appetite good, sleeps well, bowels regular, slight pains in chest occasionally. Coughs and expectorates very little, except upon arising in the morning. Temperature, 97 at 9.10 a. m.; pulse, 88; respiration, 14; weight, 124; chest circumference, 34¾ inches; chest inflated, 35¼ inches; chest deflated, 31½ inches; chest expansion, 3¾ inches.

Inspection.—Fairly well shaped chest, slightly flattened in superior quadrant. Slight retraction of right apex. Slight left lateral curvature of dorso-lumbar vertebra. Body well nourished. Muscles hard and well developed. Francke's striæ absent.

Right lung, anteriorly.—Myotatic reflex absent. Tactile fremitus negative. Expiration prolonged to second rib. Slight increase in vocal fremitus above clavicle. Very slight whispered pectoriloquy above clavicle.

Right lung posteriorly.—Tactile fremitus negative. Slight dullness opposite first dorsal vertebra. Moderately prolonged expiration to third dorsal vertebra, from this point to the sixth, very slightly prolonged. Slight increase in vocal fremitus to second dorsal vertebra. Slight whispered pectoriloquy to second dorsal vertebra.

Left lung, anteriorly.—Myotatic reflex absent. Tactile fremitus negative. Percussion negative. Expiration slightly prolonged to second rib. Vocal fremitus negative. Whispered pectoriloquy absent.

Left lung, posteriorly.—Tactile fremitus negative. Percussion negative. Respiration normal. No increase in vocal fremitus. Slight whispered pectoriloquy over bronchus down to second dorsal vertebra.

Other organs and tissues.—Normal.

Pulmonary summary.—Slight consolidation or profound infiltration of right apex, anteriorly; from the clavicle to second rib this lung is infiltrated. Moderately profound infiltration of right lung, posteriorly, down to second dorsal vertebra, from which point to third dorsal vertebra the lung is infiltrated; from the third to sixth dorsal vertebra it is very lightly infiltrated. Slight infiltration of left lung, anteriorly, down to second rib. Left lung, posteriorly, normal.

Plate 21 shows the extent of pulmonary involvement at this time. Comparing this with plate 20 shows the marked improvement in the condition of the lungs since the first injection of mercury, March 2, 1908. May 22, weight 126 pounds.

Special attention is invited to cases Nos. 8 and 9.

In case No. 8 the extremely advanced pulmonary condition was complicated by a tubercular prostatitis (suppurative) and by a serious nephritis. From our knowledge, gained at post-mortem, of

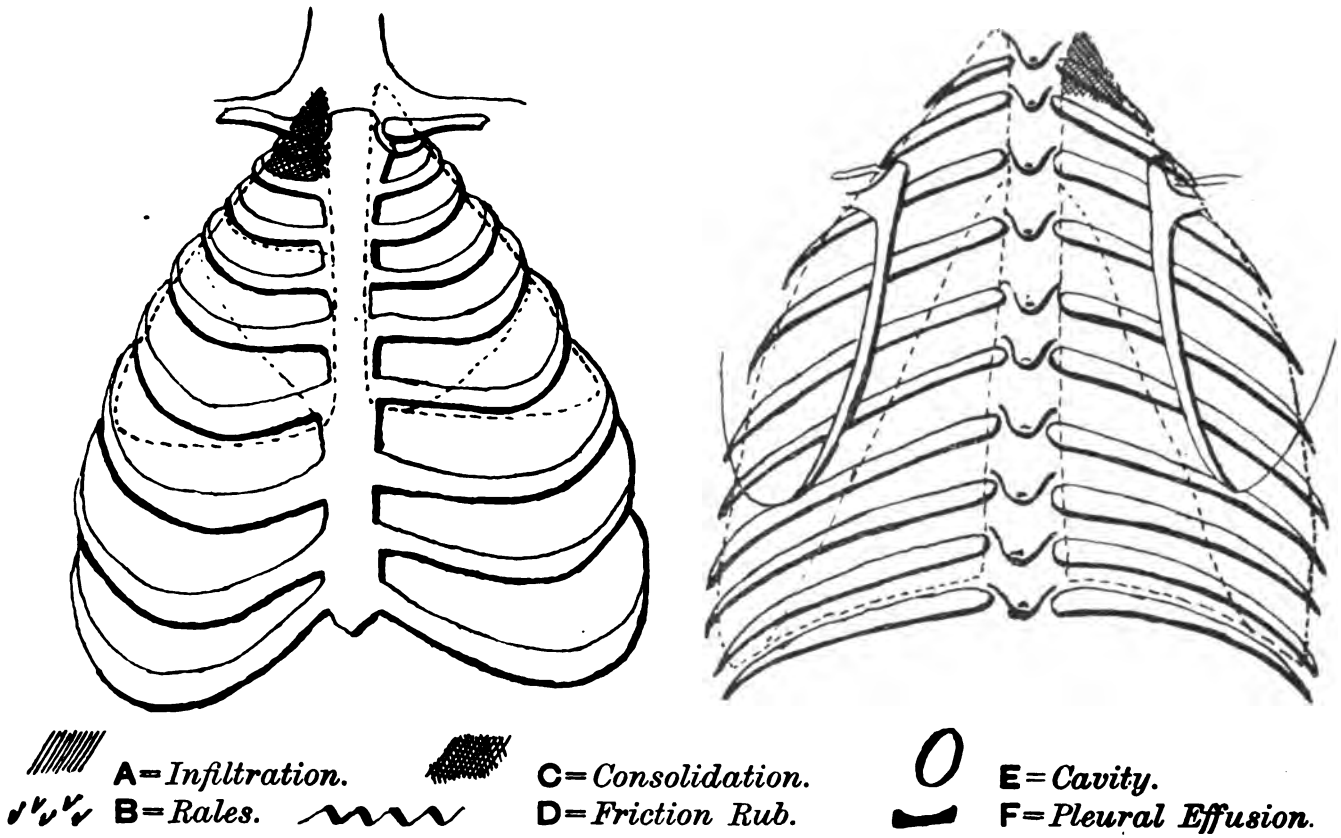


FIG. 19.—CHART SHOWING THE EXTENT AND CHARACTER OF THE PULMONARY LESIONS IN CASE 12 ON SEPTEMBER 18, 1907.

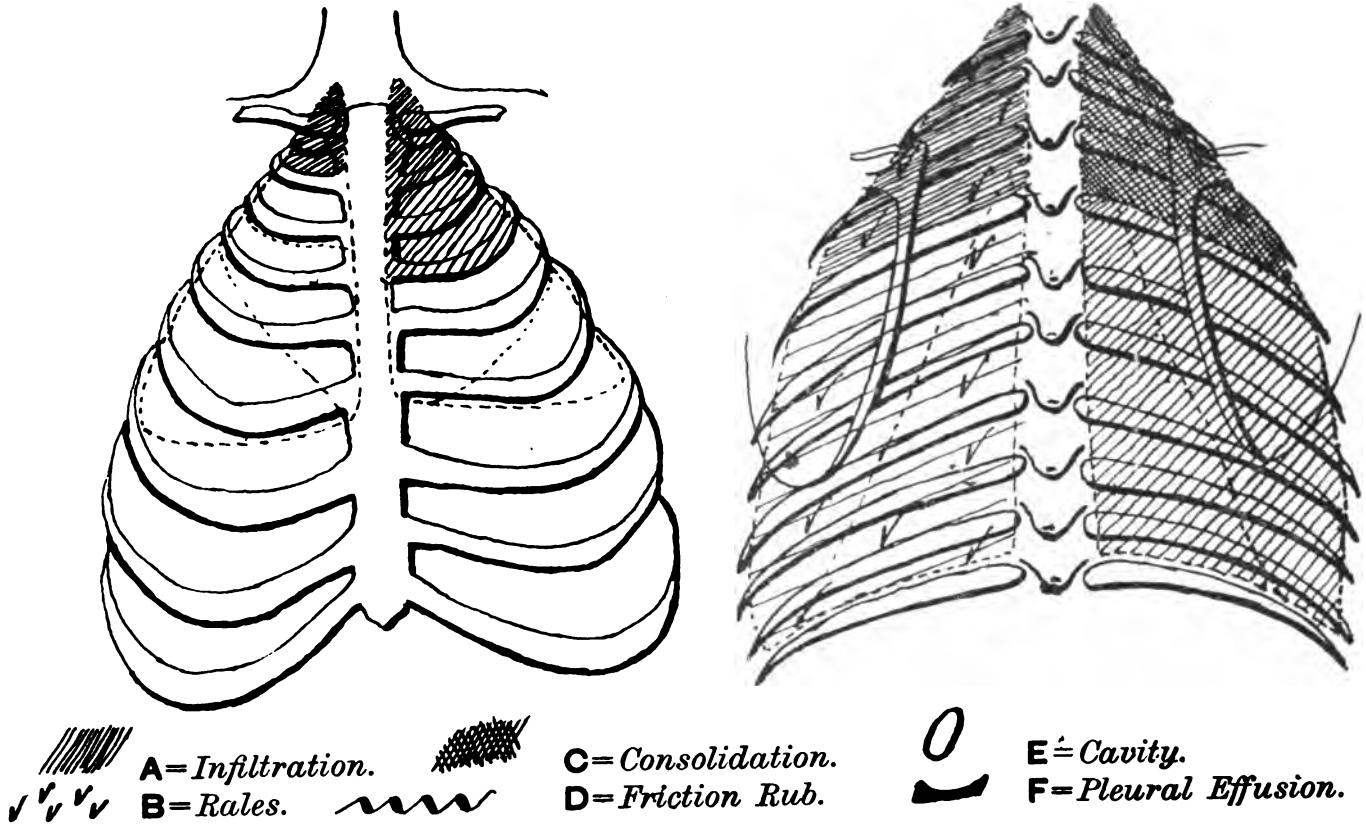


FIG. 20.—CHART SHOWING THE PROGRESSIVE INCREASE IN THE PULMONARY LESIONS IN CASE 12 ON JANUARY 12, 1908, THIS BEING THE THIRD PHYSICAL EXAMINATION.

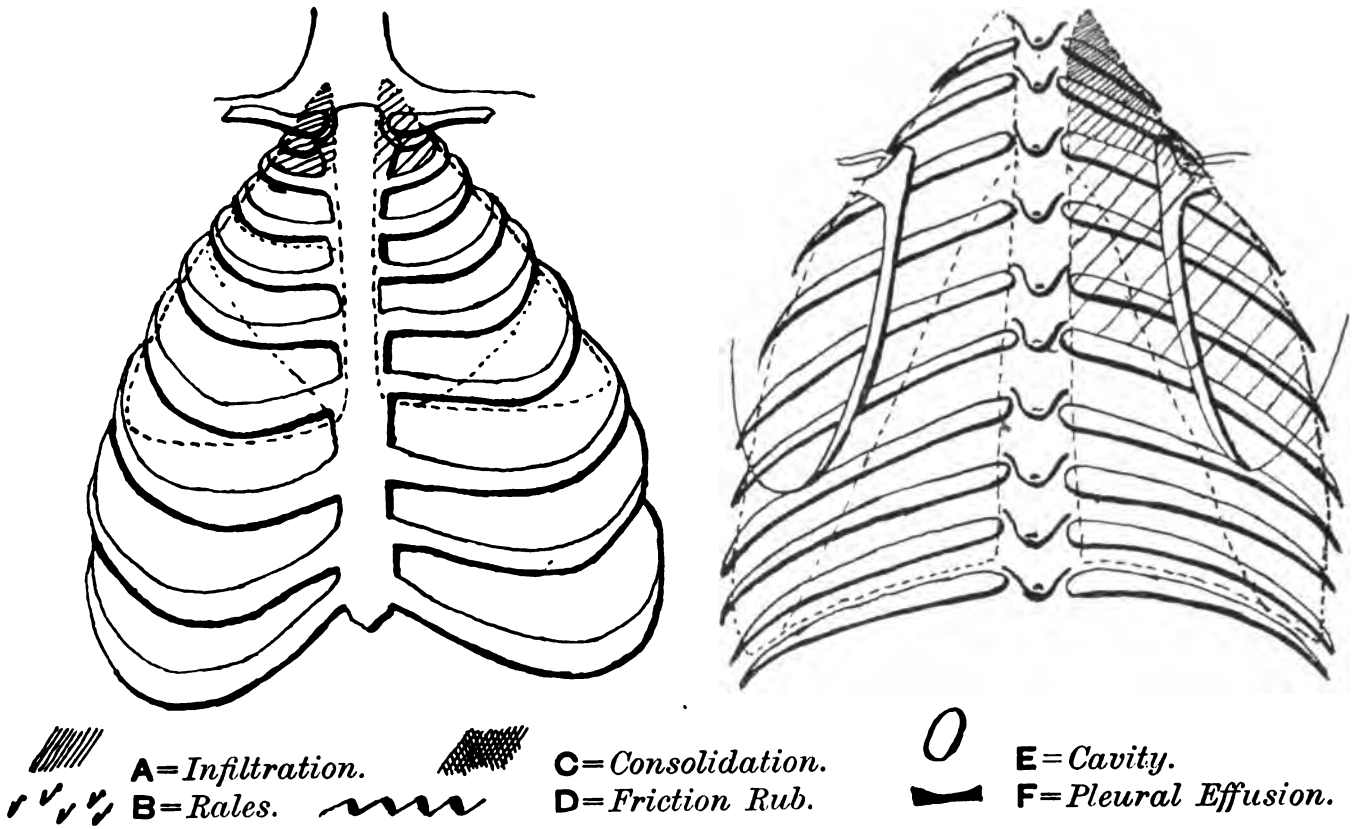


FIG. 21 —CHART SHOWING THE MARKED IMPROVEMENT IN THE PULMONARY LESIONS IN CASE 12 ON MAY 11, 1908, HAVING BEEN ON THE MERCURY TREATMENT SINCE MARCH 2, 1908.

these advanced cases of such long standing, it is most probable that the nephritis was also tubercular. This opinion seems to be sustained by the fact that it is rapidly improving under mercury, while the drug is contraindicated in other forms of nephritis. The prostate is now about normal, though the left lobe is small, hard, and fibrotic.

In case No. 9 the left epidydimus was tubercular; this condition is very much improved and the organ is nearly normal.

Since beginning this paper 7 patients with secondary laryngitis have been admitted to the hospital and placed on mercury; 6 of these cases are showing rapid improvement; the seventh, being much the worst, is slowly improving.

CONCLUSIONS.

From the cases reported above, and a number more not reported for lack of space and time, I believe that the conviction expressed earlier in this paper "that in mercury we have a specific for tuberculosis" is well sustained.

That the drug has a direct destructive action upon the tubercle bacillus seems most probable, judging from the laboratory reports upon sputum submitted for examination.

PATHOLOGICAL ANATOMY OF GUHA.

By Passed Asst. Surg. A. J. Geiger, U. S. Navy.

The following article is extracted from the report of the pathologist now engaged in the investigation of the diseases peculiar to Guam. The bacteriology of this disease will be considered in a subsequent number.

Skin: In young children there is usually found a diffuse dermatitis (a low grade of inflammation), or there may be a diffuse desquammation, or some portions of the body may show the inflammatory condition while other portions show the desquammation. In adults active ulcers, or cicatrical evidence of them, are often found.

Mucous membrane: A low-grade inflammation of the mucous membrane of the pharynx, tonsils, faucial pillars, and soft palate is quite common. It may be a diffuse inflammation, but is more commonly of granular type. In young children who die of the intestinal form of the disease a purulent valvo-vaginitis is sometimes found. The inflammation may be diffuse, but is more commonly of the granular type.

Tonsils: The tonsils are usually of a normal size, though they may be somewhat enlarged. A section through the tonsils often reveals

small white granules of connective tissue, about 1 millimeter in diameter.

Larynx: No changes have been found in the larynx.

Trachea: The mucous membrane of the trachea often shows a diffuse but more commonly granular inflammation, the upper portion being less affected than the lower.

Pleural cavity: The pleural cavity generally contains the normal amount of fluid, but sometimes may be greatly increased. The appearance of the fluid has always been found normal.

Pleura: The pleuræ are generally normal. Sometimes there are bands of adhesions, but the lung tissue beneath has always been found involved (active or healed lesions), so that the involvement of the pleuræ may be considered a direct extension of the disease in the lungs. In a few cases the visceral pleuræ were studded with small elevations 1 millimeter to 2 millimeters in diameter, and having the appearance of vesicles but not containing fluid.

Lungs: In very young infants there is generally a diffuse pulmonitis. The lungs are of a deep red color throughout. In children from 1 to 5 years of age, while there is often a diffuse pulmonitis, distinct lobes or lobules are more intensely involved than other portions of the lung, giving the appearance of hemorrhagic infarcts. The entire lung may be covered with hemorrhagic spots located just beneath the pleuræ. On cutting the involved area, a frothy sanguinous exudate appears. A portion of the involved area, placed in water, sometimes sinks, but generally floats at or near the surface of the water. The bronchiole leading to the involved area may show a diffuse or granular inflammation and generally contains a tenacious seromucous exudate which may be stained with broken down blood pigment, giving it a reddish-brown appearance. The exudate is seldom purulent. Sometimes, in adults, when the disease has been of long duration, small masses of caseous material may be found just beneath the visceral pleuræ. In the case of a man 33 years of age, the entire left lung was represented by a mass of caseous material no larger than a man's fist. The pleura over the mass was well preserved. The pleural cavity was filled with a clear, slightly yellowish fluid. Examination for bacillus tuberculosis in this case, as in others, proved negative. In chronic cases, the involved areas, instead of being deep red, have a bluish-purple color, like that of a vein. In cases that recover it may be assumed that resolution generally takes place and that the lung again becomes normal. In one case, however, which gave a history of repeated attacks, autopsy showed the entire lower lobe of the left lung completely organized. Microscopical examination of the involved area shows the air cells filled with blood. Blood pigment is found scattered throughout the specimen in the air cells,

capillaries, and lymph spaces. The involved portion of the lung generally shows a compensatory emphysema.

Mediastinal and bronchial lymph nodes: In cases where the lungs are involved the mediastinal and bronchial lymph nodes are enlarged and often filled with blood pigment, giving them a reddish-brown appearance. In cases of long duration they are often found to have undergone a caseation necrosis. In one case, an anterior mediastinal node, which had caseated and was in contact with internal mammary blood vessels, caused an erosion of the vessel walls, resulting in a fatal hemorrhage.

Heart: If a considerable portion of the lungs are involved, the right side of the heart is engorged. Antemortem clots are quite common.

Blood: During a severe attack the leucocytosis is marked, the leucocytes numbering from thirty to thirty-five thousand per cubic centimeter. The erythrocytes are generally slightly decreased, but may be reduced to three or four million. Effusions of blood are occasionally found in various portions of the body, more particularly beneath the serous membrane, notably the peritoneum.

Stomach: No changes have been found in this organ.

Intestines: A diffuse enteritis is generally found. As in other diseases, wherein the inflammation is of bacterial origin and not toxæmic, the enteritis progressively increases as far as the ceacum. A few small ulcers may be found. In chronic cases the bowels may contain a considerable quantity of broken down blood. Peyer's patches are often swollen and distinctly visible. Involvement of the solitary glands may give the intestines a mottled appearance. Mucous membrane over the summit of Peyer's patches and the valvulæ conniventes are frequently found eroded. Unlike typhoid and tubercular ulcers, only the mucous membrane is involved. In protracted cases, wherein the disease has reoccurred from time to time, the intestinal wall has been found greatly thickened. The quantity of feces is usually small; when death has occurred within a few days after the invasion of the disease the color is distinctly bronze-green; when occurring later, it is paler than normal.

Mesenteric and retro-peritoneal lymph nodes: These are almost always enlarged and may contain broken down blood pigment, giving them a reddish-brown appearance. In chronic cases they often show caseation necrosis.

Liver: The liver is generally congested, though in some cases it appears paler than normal. In chronic cases small areas of caseation necrosis the size of a pea are not very uncommon. They are most commonly located in the upper portion of the right lobe just beneath the capsule. Sometimes only healed areas are found. If the necrosis

has extended through the capsule, strong bands of adhesions extending to the peritoneum may be found. Microscopic examination generally shows the presence of blood pigment, cloudy swelling of the parenchymatous cells, and sometimes small areas of tissue necrosis. In old cases fatty degeneration and infiltration are often quite marked.

Spleen: The spleen is generally enlarged and congested. Healed infracts are quite common in chronic cases. Microscopically the tissues appear œdematous, the cells show cloudy swelling, and a large amount of blood pigment is present.

Kidneys: Microscopically the parenchymatous cells show cloudy swelling and the tubules are filled with blood pigment. A diffuse nephritis is present—in acute cases, of the parenchymatous variety. In recurring cases there is also an increase of the interstitial tissue.

Urine: During the attack the urine contains albumen and granular casts, the amount of albumen and the number of casts depending upon the severity of the attack.

Peritoneum: Except for the bands of adhesions sometimes present, the parietal peritoneum has always been found normal. In chronic cases the peritoneal covering of the liver and spleen frequently shows vesicular appearing spots similar to those in the pleuræ—round or oval in shape, and about 1 to 2 mm. in diameter.

HISTORY OF EPIDEMICS IN GUAM.

By Surg. F. E. McCullough, U. S. Navy.

The remoteness of the island of Guam from the continents saved it from many of the epidemics which have visited the civilized world from time immemorial. Search among the remaining archives which vandal hands have not destroyed, and the writings of Spanish historians fails to elicit evidence of any introduced epidemic of importance until 1856, three hundred and thirty-five years after Magellan's discovery of the island and over one hundred and fifty years after the practical subjugation of the aboriginal inhabitants.

A devastating epidemic occurring in the summer of 1849 is recorded by Governor Pablo Perez. It followed close upon typhoons and floods. Foods deteriorated as a result of moisture and mildew and the planted cereals were devoured by larvæ. The characteristics of this disease were apparently a severe diarrhea and extreme anæmia. The epidemic ceased when food supplies arrived from the Philippines and the rainy season terminated.

Chickenpox probably existed in Guam shortly after the Spanish occupation, and still occurs frequently, presenting the same group of symptoms found in the continental world. It is termed water

pox—a term borrowed from the Spanish—and has traditionally existed "so long that the memory of man runneth not to the contrary."

In March, 1856, the British schooner *E. L. Frost* arrived from Manila with two cases of smallpox; both of the victims were influential residents of Guam. They were landed and housed close to the capital city, without reckoning on the probable consequences. Neither military nor civilian medical advice or aid was obtainable at this time, the first Spanish medical officer not being detailed until 1873. The narrative of the epidemic which followed and raged for nine months, as told by the now aged survivors, deeply pockmarked and often sightless, runs like the story of a smaller London plague:

> When the pest remained with us for more than half a year and our families and friends were dying fast and faster, many times whole families, with no one to care for them, we thought the Señor was surely to end the race of Chamorros for some offense against Him. For we noted that not many of the Spanish people were sick or died and the fury seemed directed only against us. Some who died were found on ranches almost devoured by ants, for when they died alone there was no one to bury them. I myself became not ill of the pest until it was almost gone, in November. I was well enough at Christmas to go to the cathedral mass to give thanks to the Señor for sparing my life and those who had not died, for by this time the pest was gone.

Such is the story of a superannuated resident of the gangosa colony. Villages were exterminated, and never repopulated, as instanced in Pago, and the island received a setback from which it was slow to recover. Terrible as it was, like the majority of holocausts, its gruesomeness has been grossly exaggerated. Published accounts reckoned the island population at from forty to sixty thousand, of whom only one-fifth survived.[a] The census taken at the beginning of the seventeenth century gave a population of about 4,000. An increase to forty or sixty thousand in a century and a half is highly improbable, in view of the fact that in the correspondence of the governors with their home government stress is frequently laid upon the lamentable fact that the ratio of increase in the population was extremely small. A conservative estimate would place the population at not over 15,000, though very probably it was considerably less, and among these over 5,000 deaths resulted. As there was no medical aid at hand, the intelligent governor, Don Felipe de la Corte, practiced inoculation on a large number, which no doubt saved the lives of many. The epidemic is a striking example of the terrible effects of smallpox on an unvaccinated race of people, who have acquired no immunity from past generations, in marked contrast to the Chinese, among whom, frequently, no greater importance

[a] Since American occupation the ratio of increase in the native population is over 32 per cent within eight years.

is attached to smallpox than is attached to measles on the European and American continents. This was the only epidemic of this disease which visited the island. A public vaccinator was appointed even before the first medical officer was detailed to the island.

Measles has visited the island twice, first in 1878 and again in 1889. In both epidemics nearly every child and not a few adults were affected. The mortality rate of the first is estimated at about 20 per cent; that of the second at about 16 per cent. Practically all the deaths were the result of pulmonary sequelæ. Similar results have been noted in other island races when first invaded by the disease, but with each successive epidemic the mortality rate decreases—an observation suggesting acquired immunity. Measles, however, is still considered sufficiently grave in Guam to be included among the quarantinable diseases.

Whooping cough visited the island in 1882 and 1898—the second time after the American occupation, but before an actual government had been established. In the first epidemic nearly 400 children died, the total population at that period being about 6,000. It is curious to note that in the second epidemic the mortality was about the same as in countries where the disease had existed in epidemic form for centuries.

An epidemic of acute anterior poliomylitis occurred early in the summer of 1899, imported by the Spanish steamer *El Cano*. The epidemic was not extensive and confined to one side of the island. The cases observed by the writer at the time occurred in children and young adults: paralyses, largely of the lower extremities, had ensued and persist to-day in the survivors.

Neither scarlet fever nor rötheln have been observed on the island, but a peculiar exanthem, which the Spanish termed "epidemic urticaria," is frequently seen. It lacks the classic symptoms of measles, rötheln, scarlatina, and the "fourth disease" being characterized only by a fine vesiculo-papular eruption all over the body and enlargement of the cervical lymph nodes. The rise of temperature is slight and the inconvenience is insignificant. It was noted in a large number of school children in April, 1907, and the first few in whom it appeared were not permitted to continue going to school. Within a few days the epidemic was so widespread among the school children and the symptoms so trivial that quarantine was discontinued.

As syphilis is considered by some writers as belonging to the exanthemata, a brief reference to the absence of the disease on the island may not be amiss. Guam was once a winter station for the American and British whalers. As many as 100 ships have been at anchor here during a single season. Shore leave was freely given to the crews—seafaring men, who as a class are notoriously syphilitic—and they are said to have spent their money with so lavish a hand as

to amaze the islanders. Again, Japanese schooners in considerable number have traded here for years. In spite of this no undoubted case of syphilis has been observed by the writer or his colleagues, agreeing in this opinion with Passed Assistant Surgeons McLane and Mink (International Dermatological Congress, 1907) and Dr. Pedro Sauro, of the Spanish military service, who made the same observation in 1882. Superficial observation of the victims of gangosa, the usual earmark of which disease is destruction of the nasal septum, give rise to erroneous reports of a large number of cases of tertiary syphilis existing on the island. More careful examination would have elicited the absence of the disease in the parents and the absence generally of other tertiary symptoms.

Guha has been considered in previous numbers of the Bulletin, and, fortunately, cholera is as yet unknown.

The mosquito host of yellow fever, Stegomyia calopus, exists in large numbers, and when the Panama Canal route is in operation the same vigilance that has been foreseen as necessary in Hawaii will be equally urgent in Guam.

RESULT OF THREE HUNDRED EXAMINATIONS OF FECES WITH REFERENCE TO THE PRESENCE OF AMEBÆ.

By Passed Asst. Surg. R. E. Hoyt, U. S. Navy.

In October, 1907, the microscopic examination of feces was made a part of the regular laboratory routine at the Canacao naval hospital, for the purpose of obtaining statistics as to the frequency of ameba and other intestinal parasites in the stools of officers and enlisted men of the Navy. In the latter part of November 300 of these examinations were recorded, and the percentages given below are based on the findings in these cases.

Records were also kept of blood examinations made from the first 200 patients, whose feces were examined, for the purpose of detecting or confirming any relation between blood findings and intestinal parasites. From the last hundred cases an occult blood test was made with a portion of the feces.

In order that these stool examinations might be made as nearly under the same conditions as possible, the following routine was observed: First, on the morning after admission a saline cathartic was given to those patients whose condition did not contraindicate its use; second, the first liquid stool was sent to the laboratory for examination; third, blood films were prepared; a differential white count made; the presence of parasites recorded; and, in cases which indicated other blood disturbances, further studies, such as hæmo-

globin estimation, red counts, etc., were made. The chloroform, tincture of guaiac, and turpentine test for occult blood was made with the last hundred cases examined.

It has been the opinion at this hospital that a distinction between the so-called entameba hystolitica and ameba coli, based on the points of difference first enumerated by Schaudinn, is practically impossible where specimens of crude feces only are examined. While organisms showing these distinguishing characteristics may perhaps be recognized where cultures are used and a comparative study made of them, the fact remains that it is extremely difficult to pick out these supposed points of difference with any degree of accuracy on film preparations of fecal matter. Therefore no attempt at differentiation has been made. Furthermore, as the fecal mass often contains cells which under the microscope resemble rather closely nonmotile amebæ, specimens having positive ameboid movement at the time of the examination have been recorded separately from those showing nonmotile or encysted forms only.

Of the 300 patients whose stools were examined only 20 were admitted with the diagnosis of dysentery. Ten of these cases were either hospital corps men or medical officers stationed at the hospital, and in these cases the diagnosis was based more on the discovery of motile amebæ in the stools than on any typical symptoms of dysentery. About 45 per cent of the remaining cases could be classed as "medical," and these included fevers, chiefly malaria, dengue, and typhoid; mental and nervous diseases; diseases of the blood; intoxications and medical affections of the chest and abdomen. Diseases of the eye, ear, nose, and throat are also included in this group of diseases classed as "medical."

Twenty-five per cent of the cases were "surgical," and include wounds, contusions, fractures, abscesses, tumors, and various surgical affections of chest and abdomen.

Twenty per cent were afflicted with venereal diseases.

Among all specimens of feces examined, 104, or 346 per cent, contained motile amebæ. Fourteen, or 70 per cent of specimens from the 20 patients admitted with dysentery, were positive for amebæ. Eliminating these 20 cases, there remained 84, or 30 per cent, which gave positive evidence of motile amebæ in the feces, without showing at the time of examination any symptoms which could be positively attributed to their presence in the intestinal canal.

The following table was obtained as the result of these 300 examinations:

	Per cent.
Motile amebæ	34.6
Motile flagellates	15.3
Ova of ascaris lumbricoides	10
Ova of trichocephalus dispar	6.6
Ova of ankylostoma	3.3

Included in these 300 examinations were 17 specimens from native Filipinos who were admitted to the hospital for various ailments, only 2 being admitted for dysentery. The percentages for these cases are as follows:

	Per cent.
Motile amebæ	76
Ova of ascaris	53
Ova of trichocephalus	76.3
Ova of ankylostoma	29.4

Subtracting these 17 cases from the 300 and arranging the table of percentage for white enlisted men and officers of the Navy alone, the result is as follows:

	Per cent.
Motile amebæ	32.15
Ova of ascaris	7.4
Ova of trichocephalus	2.5
Ova of ankylostoma	1.5

Sixty-six and two-thirds per cent of the dysenteric cases among white men showed positive evidence of motile amebæ.

In addition to the record of motile amebæ, one was also kept of the presence of encysted and nonmotile amebæ, and in many cases where there was doubt as to the identity of the organisms the point was settled by examinations of cultures. In 21 per cent of all cases examined either nonmotile or encysted or both forms of the organism were found in preparations in which no motile amebæ could be detected. Allowing 5 per cent for possible error, there remains about 50 per cent of all cases examined showing evidence of amebic infection.

From the first hundred cases an effort was made to discover some relation between length of service on the station and the presence of amebæ in the intestinal canal, also whether or not there was any relation between sea or shore duty and infection. Out of a total of 56 patients admitted from shore stations, station ships, torpedo boats, and the smaller cruising vessels of the Philippine Squadron, on and at which the enlisted men receive abundant liberty and are therefore often exposed to infection, 36 cases, or 64 per cent, showed positive evidence of amebæ. Of 16 cases admitted from the larger cruising ships, on which the men had spent one year on the Philippine or the China Station, 5, or 31 per cent, were infected. Of 21 patients admitted from the armored cruiser squadron, which had been but four months on the station, 7, or 33 per cent, showed amebæ on examination. Sixty-five per cent of patients admitted from strictly shore stations and 43 per cent of those admitted from strictly cruising ships gave positive tests for the organism. Prolonged service on the station and continued residence on shore, therefore, as would be expected, favors the chances of infection.

The examination of blood films, beyond showing a slight increase of eosinophiles in about 40 per cent of the cases containing amebæ (over 5 per cent in 41 per cent of these cases), showed nothing remarkable. In 19 preparations malarial parasites were discovered, 13 from blood of patients admitted with malaria and 6 from patients admitted with some other diagnosis.

The results of the tests for occult blood in the last hundred cases, while not conclusive in any way, are nevertheless interesting. Of the total of 35 cases found positive for motile amebæ, 71.4 per cent gave a positive occult blood test. Seven of these cases were admitted with the diagnosis of dysentry. The other cases were admitted with diseases in which blood in feces would not be expected. In only 6 per cent of the remaining 65 cases was the test positive, the reaction being obtained in two anklyostoma infections, one flagellate infection, and in one case of gallstones with cholecystitis.

During the eight months these examinations have been conducted, seven hospital-corps men and three medical officers stationed at the hospital, have been infected with amebæ in spite of rigid precautions against such an accident. In spite of the use of distilled water, cooked vegetables, and carefully disinfected fruits, infection occurred, and it can therefore be easily understood how simple a matter it is for men who are stationed on shore in this vicinity and who observe absolutely no precaution against it to become infected in a comparatively short time.

As before mentioned, while these officers and hospital-corps patients were admitted to the sick list with the diagnosis of dysentery, in almost all the cases the typical signs and symptoms of dysentery were absent, and the diagnosis was based chiefly on the results of stool examinations and lack of other evident cause for the symptoms present. As a rule, these symptoms began with gradually increasing debility, loss in weight and strength, anæmia, and, in some cases, digestive disturbances of various sorts—indigestion, slight diarrhea or constipation, and uneasy feelings over region of colon. In a few cases a mild neurasthenic state developed. The presence of blood and mucus in the stools and complaints of tenesmus were not present in these cases. Antidysenteric treatment (chiefly high irrigations of the colon), while causing an apparent relief of symptoms in some cases for a short time, resulted in no permanent good, and eventually those patients whose terms of duty did not expire within the eight months were surveyed and sent home.

Some few of the other patients, admitted to the hospital with diagnoses other than dysentery, gave histories somewhat similar to those described above, and such symptoms as debility, anæmia, loss in weight and strength, and digestive disturbances could not be accounted for by the diagnosis on admission. In these cases the phy-

sical and laboratory examinations would fail to give any more positive results than the presence of motile amebæ or flagellates in the stools. Many of these cases also seemed to be temporarily benefited by high irrigations of the colon.

What part, if any, the presence of amebæ played in the causation of these symptoms and what the unfavorable influences of tropical climate, that are usually blamed, is uncertain. Reasoning from a knowledge of the power of other forms of intestinal parasites to produce symptoms of a general nature, such as those mentioned, and taking into consideration the reported findings at autopsy in many cases of amebic infection without apparent symptoms of dysentery, it would be very unwise to ignore this organism as an æteological factor in affections other than typical dysentery.

A CASE OF BANTI'S DISEASE WITH SPLENECTOMY AND AN ARTERIO-VENOUS ANASTOMOSIS.

By Passed Asst. Surg. E. A. VICKERY, U. S. Navy.

The patient was a seaman, and was sent to the hospital with a diagnosis of anæmia. The following history is quoted from his case paper, starting October 14, 1908:

Family history: Unimportant. *Previous history:* Unimportant, except that eight years ago he had an attack of malaria which extended over a period of two and a half years, and was associated with splenic enlargement. He denies all venereal disease. *Present history:* About ten weeks ago, without apparent cause, he had an attack of hematemesis, vomiting, according to his own statement, about a quart of blood, which left him anæmic, weak, and short of breath. This was followed by a gradual improvement until about four weeks ago, when he had a second similar attack, from which he is now recovering. The attacks were not associated with pain of any kind nor has he had any pain at any time. The hemorrhages were preceded by nausea of only a few minutes' duration.

Physical examination: The patient is a fairly well developed, poorly nourished, anæmic man of 23 years of age. Heart and lungs negative, except for signs of compression at the left base, behind, as evinced by slight increase of breathing sounds and fremitus. Considerable lessening of the excursion of left chest on full inspiration. Abdomen negative, except for splenic enlargement. Palpation showed the border of the spleen well below the left costal border and extending as far front as the outer border of the left rectus muscle. Area of splenic dullness extended from the seventh rib to four fingers' breadth below the costal border and almost to the median line in front. The liver was not enlarged nor was there any fluid in the abdomen at this time.

Urine and sputum: Negative.

Blood examination shows: Hæmoglobin, 40 per cent; reds, 2,100,000; whites, 1,000.

Differential count shows a slight increase of lymphocytes: Polymorphonuclear leucocytes, 59 per cent; lymphocytes, 38 per cent; eosinophiles, 3 per cent; no blasts nor mast cells; no malarial parasites; considerable poikilocytosis and achromia.

October 18. This morning patient vomited 2,500 c. c. of liquid and clotted blood (actual measurement) and later 500 c. c. more. Hæmoglobin now 30 per cent. He was given morphia and ergotine subcutaneously and placed on rectal feeding and hot salt solution enemata, as it was supposed that the blood came from his stomach. There was no gastric analysis done, as it was considered that the use of the stomach tube was contraindicated.

October 22. Patient has not had any more hemorrhages since the last note, and is picking up slowly in strength.

October 26. Improving slowly.

November 1. Patient had another hemorrhage this morning of about 500 c. c. He is practically exsanguinated, and his strength and resistance are at a low ebb.

November 5. Blood examination to-day shows many normoblasts and a few myelocytes; red, 700,000; whites, 800 hæmoglobin, 10 per cent.

Dr. Richard C. Cabot very kindly consented to see the patient in consultation, and advised against operation until his blood showed some improvement, which he thought could be best accomplished by direct transfusion after the method of Crile.

November 6. An attempt at transfusion was made to-day, after Crile's technique, using the patient's brother as the donor, and although it is believed that some blood reached the patient, it could not be considered successful. The spleen has receded almost to the costal border on account of the great loss of blood.

November 14. Another attempt at transfusion was made to-day, also unsuccessfully. The patient is improving a little, and has had no further hemorrhages. Examination to-day showed a prominent abdomen and shifting dullness in the flanks, indicating the presence of ascites. The edge of the spleen is easily palpable three fingers' breadth below the rib margin.

November 24. No further change since the last note except a gradual improvement. Blood examination to-day showed: Hæmoglobin, 40 per cent; reds, 1,250,000; whites, 400. No differential count made, but normoblasts were present. Coagulation tests showed firm clots in capillary tubes in about two minutes, well within the normal limit. Since October 14 patient has been on full doses of iron and arsenic, which, together with forced feeding, probably accounts for the blood improvement.

November 25. As the patient's abdomen was steadily filling up and the spleen was enlarging, the possibility of another hemorrhage appeared more than likely, and it was evident that if any operative interference was to be attempted it had to be done immediately. The choice of submitting or not submitting to the operation was put before the patient, the object being clearly explained, and a rather gloomy prognosis as to the outcome given. He decided for the operation, and a splenectomy was done.

OPERATION.

Under ether an incision was made through the left linea semilunaris from the costal border to 2 inches below the umbilicus. Owing to lack of room, this was later extended at right angles from the upper end of the incision through the left rectus muscle into the flank. On opening the abdomen it was seen to be filled with ascitic fluid, about 2 quarts draining away. The spleen presented into the wound and was about the size of a football and not adherent to the

diaphragm except by its usual attachment, the spleno-phrenic ligament. The great omental attachment of the spleen (spleno-colic ligament) was divided between ligatures, and the spleno-renal ligament, containing the splenic vessels, was partially divided between clamps, when the patient suddenly became pulseless and showed marked signs of shock. The spleen was hastily delivered through the abdominal wound, rapidly clamped off, and removed. Just before the removal of the spleen the splenic vein was torn close to the hilum of the spleen. A profuse hemorrhage ensued, but was immediately controlled by clamping the proximal end and plugging the splenic end with the finger. The abdomen was filled with hot salt solution, packed with gauze, the clamps left in situ, and, as it did not seem justifiable to try and even partially close the abdomen, a swathe was tightly applied and the patient removed to bed, where an intravenous salt infusion was rapidly done through the left internal saphenous vein. Subcutaneous injections of ether, strychnia, and digitalin were given, and hot blankets applied. The patient rallied enough to have a perceptible radial pulse, which was 160. Stimulation was kept up during the afternoon, but toward evening he commenced to fail rapidly, and it was decided to attempt another transfusion. This was successfully done, after the method of Crile, using the radial artery of the donor, a nurse, and one of the brachial venæ comitæs of the patient. He was removed from the table in excellent condition and hopes for his recovery were entertained. The donor stood it very well, only complaining of a little faintness.

During the night and next day the patient did very well, in spite of draining a large amount of fluid, which was blood stained, but not blood. It was decided to leave the clamps in for about four days, should the patient's condition warrant it, so, on November 28, the patient was given a sniff of ether, the clamps and packing removed, and the abdominal wall rapidly closed with through-and-through sutures. When the abdomen was entered the loops of intestine were found to be covered with a fibrinous exudate, and there was free turbid fluid in the cavity, which showed the presence of a general peritonitis. No breach of technique occurred so far as is known, and it is considered that infection through the wide-open abdominal wound must have occurred after operation, and that in his weakened anæmic condition and with free ascitic fluid the patient was a favorable victim.

Dr. James H. Wright kindly performed the autopsy, and I am indebted to him for the following pathological report. He also examined a specimen of the spleen, and reported that it showed an overgrowth of the splenic connective tissue and had been the seat of

a previous infarct, the scar of which was present on the diaphragmatic surface of the spleen.

Autopsy findings: Normal heart, except for some fatty degeneration, lungs normal, liver much atrophied, with some connective tissue overgrowth, antemortem thrombi of the splenic portal and right femoral veins (he had had a mild phlebitis of the right leg about two weeks before), and a great increase of red marrow in the long bones. The stomach was adherent to the transverse colon, but showed no scars or fresh ulcers, and was otherwise normal. There was an enormous enlargement of the esophageal veins, which were undoubtedly the source of the hemorrhages. There was also an acute general fibrino-purulent peritonitis, fatty degeneration of the myocardium, and atrophy of the liver, with focal necroses and some increase of the interstitial connective tissue. Microscopical examination of sections from the liver shows larger and smaller areas of necrosis of the liver cells irregularly distributed. Some of the areas of necrosis occupy the larger part of a lobule. There is also some atrophy of the liver cells, which would in part account for the small size of the liver, which presented itself as about one-third to one-half the normal bulk. The increase in the interstitial connective tissue is not marked everywhere, and where present is confined to the branches of the bile duct. Thrombosis of the splenic vein, of a large branch of the hepatic vein, and of the right femoral vein was found. Microscopic examination of the firmer and older portions of the thrombi in these various situations shows only partial organization. No cause is found in the sections for the thrombosis. The marrow of the shaft of the right femur shows considerable replacement of the fat tissue by the red marrow, indicating an excessive activity of the blood-forming tissue. The sections from the marrow of the femur show the usual appearance of the marrow of secondary anæmia—that is to say, in addition to the usual marrow elements there is an excess of cells of the erythroblastic series. No megaloblasts are present, and the histological picture is not that of the marrow of pernicious anæmia.

Here is a case of an extremely rare disease occurring in the service, and, as there is a possible likelihood of other cases occurring, it may be well to review the subject and the literature.[a] A very thorough and comprehensive article has been published in the January number of the Journal of Infectious Diseases by Dr. J. P. Simonds, of Chicago. For service uses I have extracted freely from it for the benefit of those to whom it is not available.

Doctor Simonds reports 47 cases in the literature, which he divides into two groups characterized as follows: First, those cases occurring in patients over 20 years of age, with, clinically, enlargement of the spleen, a low white count, sometimes pigmentation of the skin, gastro-intestinal hemorrhages, and ascites; and with, pathologically, a fibrous hyperplasia of the spleen, frequently cirrhosis of the liver, and varicose veins in the lower œsophagus and cardia. The case here reported undoubtedly belonged to this group. Second, those cases occurring in young people, and which show a family tend-

[a] Torrance (Annals of Surgery, 1908, xlvii, 41) reviews 35 cases which he has collected from the literature and adds a new one of his own.

ency, and differ, clinically, by running a more prolonged course and by the occurrence of hemorrhages from the nose, gums, or under the skin and mucous membranes. Anatomically, this last group is characterized by a "diffuse proliferation of endothelium in the spleen and sometimes in the liver and retro-peritoneal lymph glands." Neither of the two cases I have seen have been of the latter type, but the literature seems to bear out the conclusions.

A common symptom complex in this disease, and one sufficient to warrant a diagnosis, I think, is an enlarged spleen associated with a progressive anæmia, a normal or low color index, a leucopenia, hemorrhages from the gastro-intestinal tract, and a late ascites. One symptom must be borne in mind, and that is the marked recession of the spleen after a hemorrhage. This is to be expected, if one considers that the spleen acts as an immense circulatory diverticulum which is emptied after a hemorrhage.

Etiologically very little can be said about the disease. The 47 cases reported by Simonds show that it occurs approximately equally in males and females, although Osler reports a series of 14 cases in which 13 were males and 1 female, and of the 36 reported by Torrance 17 were females and 15 were males. There have been several theories advanced as causative factors, chief among which are auto-intoxication from the gastro-intestinal tract, sclerosis and calcification of the portal vein, syphilis, malaria, and Leishman-Donovan bodies. Some observers believe that it may be due to a primary condition of the liver obstructing the portal circulation; others that it may partake of the nature of a new growth; and still others that it is of an inflammatory nature. Whatever the indirect cause may be, it is clear that the immediate cause is an obstruction to the portal circulation at some point, whether it be spleen or liver, and the spleen, being the weakest point in the portal system, is the organ engorged. The splenic enlargement, ascites, and hemorrhages from the stomach or lower œsophagus show this conclusively. In this case the obstruction, whatever it was, progressed rapidly, as the whole course of the disease, from the time of the first noticeable symptom up to the operation, extended over a period of only four months. It is possible, of course, that it may have existed for some time previous to the appearance of symptoms.

As regards treatment, it seems to be pretty generally conceded by both surgical and medical men that splenectomy is the only remedy, death being assured otherwise in from a few months to a few years (usually two to four years) from hemorrhage or progressive exhaustion. Operation in Simonds's series was rewarded by 16 recoveries out of 22 splenectomies, or 72 per cent, with, in most of the cases, complete relief of symptoms, although it is not stated how long

the condition persisted after operation. This is an extremely gratifying percentage of recoveries, arguing in favor of operation, and operation should be early. Our case was diagnosed before ascites had developed, and operation should have been attempted immediately. While ascites does not contraindicate operation, it shows that the obstruction has reached an advanced state and that there must be some hepatic involvement, making the outcome less favorable on that account. The day after the diagnosis was made in our case the patient had a 3,000 c. c. hemorrhage, and he was never a good surgical risk afterwards, the operation being performed only as a last resort.

The operation itself is a difficult one, owing to the inaccessibility of the pedicle, which must be approached through a generous incision. A choice of two methods is open to the surgeon after entering the abdomen: One, that of tying off the pedicle with the spleen in situ; the other, that of tying off after delivery. Other things being equal, and if there are no adhesions, it is undoubtedly much easier to tie off after delivery. It was necessary to adopt this method before the operation was completed in our case. The friability of the radicals of the splenic vein, and the danger of hemorrhage as a result of their rupture, must be guarded against by careful and gentle manipulation. There was no difficulty in controlling what hemorrhage we caused, but had we not previously delivered the spleen, thus making the pedicle easily accessible, the hemorrhage might have proved very troublesome.

The autopsy report is what would be expected from the clinical facts, and shows that the red marrow had assumed the blood-forming function of the spleen, if this theory be accepted. The thrombi in the splenic and portal veins could of course be explained by the clamping of the splenic, but the thrombus of the right femoral is not so easily explained. It may have been a coincidence, occurring in the ordinary course of a disease with long confinement to bed, or it may have been caused by the transfusion. The peritonitis was especially regrettable, as it seems quite likely that it was the direct cause of the patient's death, which might not have occurred otherwise.

The most interesting feature of the whole case, perhaps, was the transfusion, and its successful accomplishment we owe to the assistance of Dr. Joshua C. Hubbard, of Boston. Crile's technique may be found in the Annals of Surgery for September, 1907. Briefly, it is as follows: The radial artery of the donor is dissected out for about 2 inches and freed from the underlying tissues; the basilic vein of the patient is then freed in the same way at the bend of the elbow, and the flow of blood is temporarily stopped in each vessel by means of a rubber-covered Crile clamp. Crile's principle of bringing the in-

tima of the two vessels in contact seems to be essential to the prevention of clotting, and is accomplished by means of a small canula, through which the vein is threaded and the end turned back, making a cuff with the intima external. The end of the artery is then pulled over the cuff end of the vein and the clamps removed. It is an exceedingly delicate operation, and we found it difficult to do, although the mechanical aid undoubtedly makes it easier.

To a man skilled in the special technique of arterial work, the difficulty of the operation consists chiefly in drawing the end of the artery over the canula with the venous cuff. The artery contracts a great deal, and the manipulation of tying at the joint is extremely delicate, as the least jar will separate the ends of the vessels, and the work must be commenced again. Keeping the artery moistened with hot salt solution partially prevents the contraction of the artery.

The success of transfusion itself has been too well described by Crile and others to call for more than mere mention here, but to one seeing it for the first time it seems very dramatic and wonderful. In our case the patient was practically moribund. His pulse was imperceptible at the wrist, 160 at the heart; his body was cold and exsanguinated; his respirations 40 and shallow, and he had not recovered consciousness since operation, eight hours before. After about three-quarters of an hour his pulse dropped to 108 and became full and strong at the wrist; his respiration dropped to 18 and became full and deep; his lips and skin became pink, and he recovered consciousness and began to talk and laugh. The advantage of a transfusion over an infusion is that it supplies not only body for the heart to work on, but an actual increase of oxygen-carrying material in the blood. It is of value, then, not only as a means of replacing chemically altered blood, as in gas poisoning, but as a life-saving method par excellence in cases of severe anæmias caused by hemorrhage.

In conclusion, I should like to thank Doctors Richard C. Cabot, James H. Wright, Joshua C. Hubbard, Medical Inspector Howard Ames, Surgeon W. H. Bucher, and Assistant Surgeons Paul T. Dessez and Lyman H. Belknap for their advice and assistance during the progress of the case.

SUGGESTED DEVICES.

A MODIFICATION OF THE CRILE CANULA.

By Passed Asst. Surg. E. H. VICKERY, U. S. Navy.

Doctor Vickery, in his papers, reporting "A Case of Banti's Disease * * *," published on the preceding pages of this issue, comments upon the difficulty of performing Crile's special technique in arterial work, particularly those parts consisting in drawing the end of the artery over the canula with the venous cuff, and the manipulation of tying at the joint. Vickery has conceived the device here illustrated and presents it in connection with his paper, hoping that, in view of the value of the procedure, it may serve to simplify the operation and bring the attainable results of blood transfusion within the reach of a greater number.

It would seem that the difficulty of tying at the joint might be obviated if the tying could be done separately over two canulæ to be joined together afterwards, somewhat after the principle of the Murphy button. (Figures 1 and 2 illustrate the idea.)

I have had such an instrument made which might answer the purpose, but as I have not had an opportunity to try it, it is offered tentatively.

Figure 1 is a hollow canula similar to that of Crile, except that it is a little larger and has two sloping shoulders inside AB and CD.

Figure 2 is a similar canula, except that it has a little more taper, and that the backturned cuff is secured by a ligature, fitting into a groove G. Springing from the handled end of the canula are three small steel jaws, E, F, and a circular ring, H.

After the vessel ends are threaded through and separately tied, the canulas are approximated, the taper male canula engages the sloping interior of the female canula, the little steel jaws engage the rings (y) or (z) and are held by drawing up the ring H. This makes a tight joint, and obviates tying. The steel jaws of the male canula may be separated to allow the turned-back cuff to be tied.

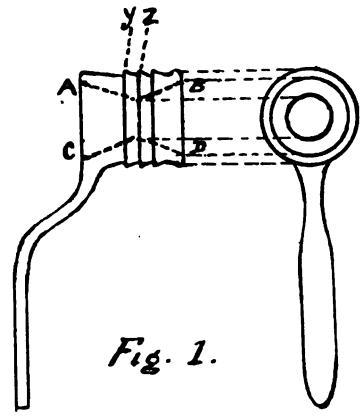


Fig. 1.

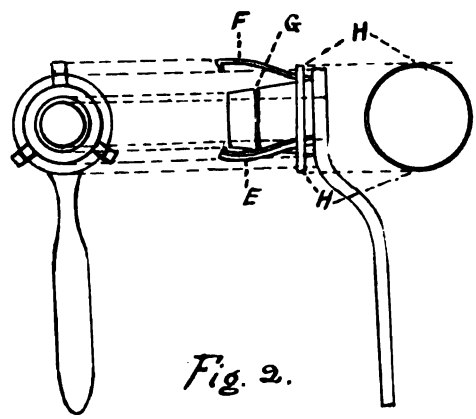


Fig. 2.

CLINICAL NOTES.

TWO CASES OF ABNORMAL KIDNEY.

[From U. S. Naval Hospital, New Fort Lyon, Las Animas, Colo., May 25, 1908.]

By Passed Asst. Surg. A. B. CLIFFORD, U. S. Navy.

Congenital absence of a kidney is a rare condition, but cases in which one kidney is rudimentary or hypoplastic are not very infrequent. Such a kidney is entirely devoid of functional activity. It is interesting and instructive from a pathological and surgical point of view that two such cases have been met among the last ten autopsies performed at this hospital.

CASE 1.

S. C. (P. M.) died January 25, 1908, pulmonary tuberculosis.

"Right kidney rudimentary, measures 1½ x 1 x ½ inches. Left kidney increased in size about one-half." The above is an extract from the report of autopsy. Unfortunately, nothing is said about the condition of the ureter. According to Casper: "In rudimentary kidney it is more common for the ureter of the corresponding side to end in a blind sac."

This condition is well illustrated in the second case.

CASE 2.

G. A. P. (P. M.) died May 8, 1908, pulmonary tuberculosis. The left kidney in this case was found to be considerably enlarged, weighing 230 grams, a compensatory hypertrophy resulting from absence of function in the right kidney. Not finding a kidney on the right side in the usual place, careful search was made and the specimen here described was discovered. It lay buried in fat, in close apposition to the vertebral column, its center being opposite the junction of the second and third lumbar vertebræ. It was dissected out with the ureters and bladder as shown in the accompanying drawing, and preserved in Kaiserling (for the drawing I am indebted to Surg. B. L. Wright, U. S. Navy).

In the specimen there are two kidneys (A) and (B), each with its ureter (a) and (b), (b) opening into the bladder in the usual place,

while (a) has no communication with the bladder, but ends in a blind sac.

(A) measures 2 x 1½ x ½ cm. It is a rudimentary kidney, showing on section no differentiation into cortical and medullary substance. It is distinct from (B) though joined to it by connective tissue. It has its own ureter, which is 28 cm. long and 1 cm. in diameter in its widest part. The ureter is patulous throughout. It has no communication with the vesical cavity, but ends in a blind sac (C), located beneath the mucous membrane of the bladder between the ureteral opening of this side and the urethral opening. This sac is roughly cone shaped and measures 3 x ¾ cm.

(B) is a fœtal kidney showing fairly distinct lobulations. It measures 6 x 3 x 1 cm. On section it shows a pelvis, partially formed pyramids, and some cortical substance, an appearance suggesting normal kidney structure.

The main blood supply is from an artery entering at the lower pole, arising from the beginning of the right common iliac. Several veins leaving the hilum empty directly into the inferior vena cava. The ureter (b) is 24½ cm. long, is patulous throughout, and opens into the bladder in a normal position.

The position of the left kidney and ureter was normal and no other abnormalities were present in the genito-urinary system.

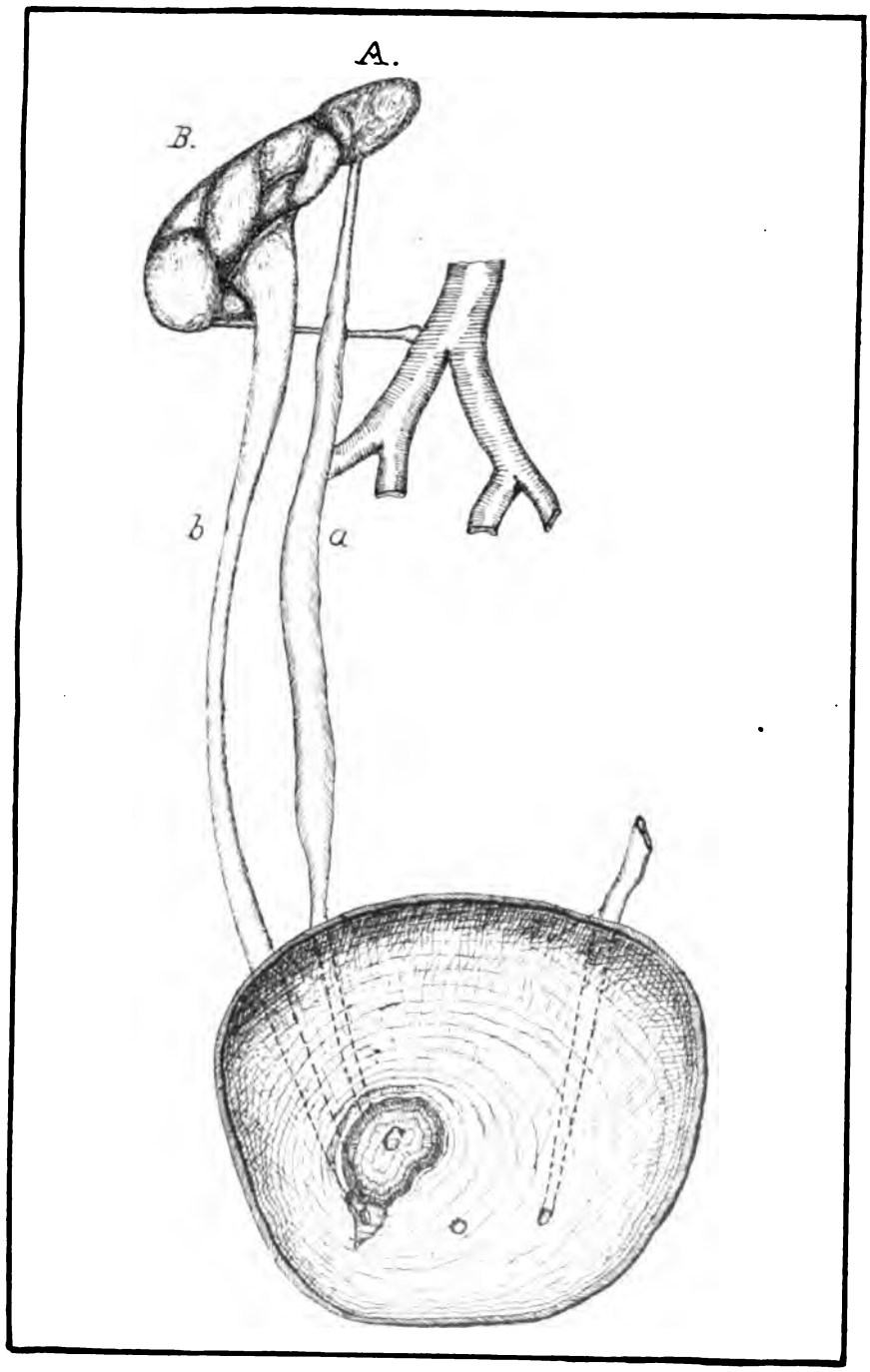
A CASE OF EMPYEMA.

[From the United States Naval Training Station, San Francisco.]

By Passed Asst. Surg. F. G. ABEKEN, U. S. Navy.

Nothing out of the ordinary occurred in the second case of empyema which I am reporting from this station. It served, however, to controvert (as far as it goes) the opinion recently expressed in one of the leading medical journals, that whenever pleural pus revealed Frankels pneumococcus only, the fluid should be merely aspirated and no elaborate drainage established. This coccus, however, is closely associated with the idea of fibrin formation, as seen in pneumonia, and in the clotted exudations of pleuritis from pneumococcus infection, which led me to doubt even the possibility of cleaning out such cavities by mere aspirations. Nevertheless, I determined to try it.

Upon several careful examinations of the case above referred to, the pleural contents proved to contain only this one pathological organism, pneumococcus, and, therefore, offered an opportunity to test the soundness of the above-noted opinion. Aspiration failed, the needle soon becoming occluded with fibrinous clots; a large trocar and then an intercostal incision served the purpose no better. Under



CASE OF ABNORMAL KIDNEY.

FIG. 1 —SHOWING DOUBLE URETER; (*a*) BLIND; (*b*) PATULOUS.

local anæsthesia about 1 inch of the sixth rib was resected and a drain inserted, but within ten days the temperature and pulse assumed a septic type, indicating retained and decomposed pus. A much larger piece of rib was then excised under general anæsthesia, through which all the adhesions within reach were broken down, large masses of fibrinous matter removed, and a ¾-inch tube, surrounded with gauze, inserted. The patient has now only a small short wick in the wound, and is expected to return to duty in the near future.

According to this one case, at least, therefore, the presence or not of the pneumococcus is not a safe guide in deciding on operative procedure as between simple aspiration and thoracotomy, and it is my opinion that in such cases thorough drainage should be established at once.

CASE REPORTS.

[From U. S. Naval Hospital, Canacao, P. I.]

By Asst. Surgs. E. H. H. Old and A. E. Lee, U. S. Navy.

A CASE OF FULMINATING APPENDICITIS WITH NORMAL TEMPERATURE AND PULSE; OPERATION; RECOVERY (E. H. H. O.)

V——, L. T., el. third class. Admitted December 9, 1907, from the U. S. S. *Wilmington*. Diagnosis: Appendicitis.

[Abstract from case paper No. 278 of 1907 series.]

HISTORY.

While at work yesterday afternoon he was suddenly seized with severe pain of cramp-like character in his abdomen; vomited several times; pain later became localized in right iliac region; was given an enema aboard ship and not allowed anything by mouth.

On admission here the next morning his temperature was 98.4 (mouth), 99.2 (rectum); pulse, 80. Facies somewhat anxious. Held right leg and thigh flexed. Complained of severe abdominal pain, which was most intense over region of appendix.

PHYSICAL EXAMINATION.

Abdomen slightly distended, rigid, and tender all over; these signs most marked over appendicular region. No mass felt. On percussion the abdomen is tympanitic except in the right iliac region, where distant dullness is obtained. Leucocytes, 17,200. Immediate operation advised.

OPERATION.

Ether. Right rectus incised and muscles retracted. Appendix found embedded in new adhesions back of cæcum and perforated at tip; perforation about size of blunt end of a pencil and edges necrotic. Appendix removed in the usual way and wound drained. Recovery uneventful.

CONCLUSION.

This case was considered of enough interest for special report on account of the normal temperature and pulse existing under such a pathological condition as described above. That immediate operation was indicated we determined by the distinct dullness obtained over the appendicular region, together with the marked tenderness and rigidity, and the moderately high leucocytosis.

A CASE WITH A STERILE COLLECTION OF BLOOD IN THE PLEURAL CAVITY GIVING RISE TO SYMPTOMS RESEMBLING THOSE OF AN EMPYEMA; OPERATION; RECOVERY (E. H. H. O.).

B——, G. L., g. m. third class. Admitted August 12, 1907, from the U. S. S. *Barry*. Diagnosis: Vulnus incisum.

[Abstract from case paper No. 470 of 1907 series.]

HISTORY.

While on liberty he became intoxicated and involved in a fight with a native at Olongapo, P. I. Says the Filipino stabbed him when he had his back turned and does not know what instrument was used. The wound, however, is of a character that might be inflicted by the pocketknife, which has a blade about 4 inches long and is usually carried by natives here.

This happened on August 6. Patient was treated in the sick quarters at Olongapo from that time until August 12, when he was admitted here. His temperature register at Olongapo the morning of his transfer to this hospital was 104; pulse, 120, on account of which and a marked rigidity of abdomen the hospital ticket sent with patient stated that "peritonitis had apparently developed."

PHYSICAL EXAMINATION.

Patient's expression is not anxious; respirations only slightly increased and are regular; temperature, 100.6.

Wounds.—Sutured wound 1 inch long between third and fourth ribs and an inch from right border of sternum; sutured wound 1 inch long over upper part of left scapula; slight, healed wound in occipital region.

Right thorax, anteriorly.—Hyperresonant, with exaggerated voice and breath sounds.

Right thorax, axillary line.—Above, same findings as in front. Dull from fourth rib down. At upper border of dullness the bronchial voice and whisper (egophony type) are heard; these signs are much diminished below. Fremitus is diminished.

Right thorax, posteriorly.—Hyperresonant above; dull from spine of scapula to lower angle; flat below this to base. At upper border of dullness, bronchial breathing, voice, and whisper (egophony type) are heard; they are also heard below this, but are very distant.

Left thorax.—Nothing abnormal elicited.

Heart, liver, and spleen.—Normal, as far as could be discovered.

Abdomen.—Not distended, but rather rigid. Some tenderness, which is more marked over the region of appendix and bladder. Patient states that his bowels have not moved for a week. Tongue is coated.

Urinalysis is without interest.

Leucocyte count shows 10,000 per cubic centimeter.

It was thought that the anterior wound had bled freely into the pleural cavity when the stabbing occurred and that the signs elicited were caused by a large collection of blood there or that this blood had become infected and gone on to a condition of empyema; that the abdominal symptoms were due to the prolonged constipation and to the chest condition.

An aspirating needle was passed into the chest between eighth and ninth ribs behind and some bloody serum withdrawn. Considering that this evidence sufficiently verified the diagnosis and that no empyema had developed, and, moreover, as patient's condition was good, it was thought best to delay radical measures and palliate for a time on the chance that the blood might be absorbed. His bowels were moved and all abdominal symptoms disappeared. His temperature did not rise above 101 until August 18, when it was 103, with a pulse of 112 and respiration 40. On this day the chest signs were those of a regular lobar pneumonia of the upper and lower lobes, the middle one not being involved. On August 20 the temperature was 103; pulse, 120; respiration, 70. After this the clinical symptoms improved, but his general condition gradually declined. On August 29 his left leg was swollen and painful; phlebitis had developed. Temperature gradually declined and was normal on September 11; but it rose again and, on the 15th, was 102; pulse, 118; respiration, 40. Chest signs were as first described; no change in area of flatness; fremitus almost entirely lost; few subcrepitant râles. He was having profuse night sweats and his general condition was becoming worse. Phlebitis had subsided. Leucocytes: 12,600 with 71 per cent polymorpho-nuclears. Chest again aspirated and some dark bloody fluid removed. Operation advised.

OPERATION.

On September 18 patient was anæsthetized with chloroform. About 2 inches of eighth rib in posterior axillary line was resected. On opening the pleural cavity about a pint of dark blood and disintegrated clot escaped. Drainage tubes were inserted and wound dressed. There was no evidence of any infection and cultures from the fluid were sterile. The operation resulted in prompt benefit and was a complete success. His temperature dropped to normal and remained there. His general condition began to improve immediately. On October 2 he was allowed up in a chair, and, on the 16th, was walking around. The wound had entirely healed by November

after the first operation, a second one was performed in order to secure better drainage and at the same time determine whether or not there was a fistula.

SECOND OPERATION.

Patient anæsthetized with chloroform. Chest wound enlarged and about 3 inches of the seventh rib resected. Lung collapsed and presented only a slight bulging convexity along inner wall of thorax; outlines indistinct. Apex beat seen just within wound; chest wall greatly retracted. About half a pint of fluid, like that being discharged from wound in lower part of pleural cavity; pleuræ covered with purulent lymph plaques. No opening into a viscus could be seen or found, but a scar in the diaphragm over the region of the stomach indicated that a fistula might have existed and had healed and that the pleural infection had come from this source. The fluid was sponged out, a counter opening made behind, chest irrigated, and drainage tubes inserted.

For the next four days the patient's condition was critical. During this period his temperature was 103 in the evenings, but on the fifth day it dropped to normal, and, except for a few slight fluctuations, remained there. His weakness and loss in weight progressed until he had become a mere skeleton, with hardly strength enough to raise his arms. The discharge continued to be profuse, though becoming more purulent in character and losing the foul odor. On May 30, three weeks after the second operation and six after the first, he began to show signs of improvement. From this time on the patient continued to slowly gain strength; he became brighter, his appetite returned, the discharge decreased, and the wound began to close in. On July 17 he was up walking about, and from which date his history is that of slow convalescence. After the chest wound had ceased discharging the lung on that side began to expand, and when examined recently there was distinct vesicular breathing over that side down to region of operation: a few rough pleural rubs continued; no cough; sputum negative for tuberculosis. The patient was discharged on November 9, 1907, and a few days later resumed his work at the United States naval station, Cavite, P. I.

A SEVERE CASE OF TETANUS IN A NATIVE CHILD; CURED (A. E. L.).

The patient, a Filipino child, 4 years and 8 months old, had its hand crushed in an anchor chain while playing on one of the coast vessels. The accident occurred on September 22, and five days later the patient came to this hospital for treatment. The wound was in a very poor condition, an active suppurating process having set in, with sloughing and gangrene of the surrounding tissues.

The thumb was completely torn out at the carpo-metacarpal joint, leaving a large necrotic area with thickened and sloughing skin edges. The wound was carefully washed out and as much as possible of the necrotic material removed. Wet dressings were applied, the patient returning daily for treatment.

On the evening of October 1 the mother said that the child complained of pain in its jaws and was unable to take food. The patient was admitted into the hospital with tetanus the next day, October 2, just eleven days after the accident had occurred. Examination showed the jaws fixed beyond the movement of half an inch, together with considerable stiffness of the neck muscles, and a mask-like expression about the face. One thousand units (new) antitoxin were immediately injected deeply into the deltoid.

On October 3 the general condition was much worse; jaws completely locked; rigidity of neck and back muscles extreme, verging on opisthotonos, and risus sardonicus present. By noon the child had had two convulsive attacks of very short duration accompanied by marked opisthotonos and cyanosis. One thousand units (new) antitoxin were injected into the spinal cord.

From October 4 to October 12 there was no material change for better or worse. The child seemed to be in no pain and slept most of the time; the pulse was fairly good; the respirations were rapid, and thoracic in type, owing to rigidity of the abdominal muscles. On October 7 clonic spasms developed, starting in the muscles of the back and extending into the lower limbs. The attacks were of very short duration and occurred about a minute apart. The temperature ranged from 99° to 103° F.

The child was put on nutrient enamata after the second day, and an injection of antitoxin (1,000 units) given daily, in spite of the fact that, clinically, one single injection of 1,000 units is considered sufficient to neutralize all the possible toxin generated, and, in addition, that the tetanus organism, which we had isolated in pure culture from the hand, undergoes bacteriolysis in a few days after the antitoxin is injected.

October 14 marked the beginning of a general improvement and abatement of the physical signs; gradually the locked jaws began to yield; liquid food could again be taken, and the rigidity of back and neck muscles was finally broken. Complete recovery came in about two weeks and the child was able to walk, unaided, a distance of 1 mile in order to have the hand dressed. It may be interesting as it is gratifying to note in this case that not only was it our good fortune to preserve the life, but the hand, which at first promised to be useless, has completely healed with considerable movement in the wrist and four remaining fingers.

Conclusion.—My only reason for presenting this case may be found in two of the Hippocratic aphorisms regarding the prognosis of this disease, with which it so admirably agrees: "The spasm supervening in a wound is fatal, and such persons as are seized with tetanus die within four days, or if they pass these they recover;" and again, the mortality of traumatic cases is not less than 80 per cent (Osler).

A CASE OF SPLENO-MYELOGENOUS LEUKÆMIA; DEATH; AUTOPSY (A. E. L.).

——, W. L., fireman second class, was admitted to this hospital from the U. S. S. *Mohican*, August 12, 1907, with the diagnosis of leucocythemia.

[Abstract from case papers.]

Personal history.—Negative.
Family history.—Negative.

PRESENT ILLNESS.

This began about three months prior to admission, with shortness of breath and cramps in the hands. A general glandular enlargement also was noticed at this time. He became progressively worse, and on admission showed a distinct lemon tint to the skin, marked conjunctival hemorrhages, and purpuric spots over limbs and abdomen. There was a general glandular enlargement, especially marked in the region of the parotid; abdomen distended with gas and fluid in the flanks; spleen greatly enlarged, reaching to the umbilicus and beyond the median line for a distance of 4 cm.; liver two finger breadths below the costal margin; heart dulness increased, and sounds clear, but feeble; lungs clear throughout, except for a few fine râles at both bases; lower limbs markedly œdematous, pitting on even slight pressure.

During the few weeks following the patient's admission he steadily lost strength. The abdomen remained very much distended, owing to gas, enlarged organs, and fluid. The abdominal walls became markedly œdematous and many large purpuric spots developed. Hemorrhages occurred also into the conjunctival and mucous membranes and from the intestinal walls. The skin presented a deep lemon tint. All glands were enlarged, especially those in the right axilla and the left submaxillary and left auricular glands. His heart weakened gradually, but progressively, and he experienced much difficulty in breathing. Patient resisted the influence of all methods of treatment, such as Fowler's solution, colon irrigations, hypodermics for stimulation, etc., and died September 9, 1907.

CASE OF SPLENO-MYCLOGENOUS LEUKÆMIA.

FIG. 1.—PATIENT ON ADMISSION, SHOWING SLIGHT PAROTID INVOLVEMENT.

Chemical Examinations.

Blood (chart of consecutive findings).[a]

Date.	H. g. per cent.	White count.	Red count.	Poly.	Differential.				Mast.	Myelocytes.	Nucleated reds.
					S. L.	L. L.	L. M. N. Trans.	Gos.			
1907.											
Aug. 13	90	45,200	5,700,000	29	35	6	6	2	0	22	.....
16	85	52,400	4,150,000	.....	.....	.....	.....	.....	.....	.....	.....
17	75	49,800	2,100,000	.....	.....	.....	.....	.....	.....	.....	.....
18	65	33,800	2,100,000	.....	.....	.....	.....	.....	.....	.....	.....
19	43	41,200	2,760,000	10	61.5	7	13.5	.5	3	4.5	9
20	39	34,700	2,170,000	11.5	65.5	2.5	9	2.5	.5	8.5	31
21	46	30,800	4,100,000	14.5	63	4.5	13.5	1	5	3	44
22	39	32,200	4,100,000	12.5	57	12.5	9	2	1	7	72
23	33	38,200	1,930,000	11	65	6.5	11	0	.5	6	121
25	35	53,000	1,580,000	20	39.5	6	25	.5	1.5	7.5	389
26	35	46,000	1,750,000	32	21	7	31	3	1	5	263
27	42	52,000	2,150,000	20	21	9	39	1	2	8	190
28	50	50,500	2,000,000	.....	.....	.....	.....	.....	.....	.....	.....
29	40	52,800	4,560,000	27.5	13.5	6.5	36	4.5	1	11	348
30	40	44,600	1,520,000	15.5	32.5	7	32	3.5	1.5	8	222
Sept. 1	40	38,000	2,075,000	.....	.....	.....	.....	.....	.....	.....	.....
2	40	50,000	1,530,000	20.5	32	8	14	1	1.5	9	121
3	40	43,600	1,665,000	.....	.....	.....	.....	.....	.....	.....	.....
4	50	38,200	190,000	22.5	33	3	33	1	.5	7	37
7	40	22,600	1,500,000	28	43	3	24	2	.....	2	39

[a] It is interesting to note the decided change in the blood picture from that of a myelogenous leucaemia to that of a pernicious anaemia.

Note.—In all the differential counts 200 cells were counted.

Urine.—Throughout the course of the disease there was a slight trace of albumin, a few hyaline and granular casts, and a few red blood cells.

Autopsy.

GENERAL APPEARANCE.

Marked emaciation; general anasarca; purpuræ scattered over whole body; skin lemon-colored.

GROSS ANATOMY.

Thorax: Right plural cavity contained 1,250 c. c. straw-colored fluid. Left pleural cavity contained 1,800 c. c. straw-colored fluid.

Mediastinal space (anterior): Completely filled up with a large thick adherent mass, extending a distance of about 4 inches to either side of mid sternal line and posteriorly adherent to the parietal pericardium, completely surrounding it and extending to the thoracic aorta, which it also completely surrounded. The mass passed upward into the neck, completely surrounding the arch of the aorta and the great vessels. It weighed about 800 to 1,000 grams, was rather firm and elastic, of a peculiar grayish yellow color, mottled with hemorrhagic areas. It looked like infiltrated glandular tissue.

Pericardium: It contained 170 c. c. of straw-colored fluid. Was thickened and adherent to this large mediastinal mass.

Heart: Weighed 400 grams; muscle pale and flabby; valves normal.

Lungs: Crepitant throughout; small areas of hemorrhage on the surface and in the deeper structures.

Abdominal cavity: Contained 200 c. c. straw-colored fluid. Peritoneum smooth and glistening.

Liver: Weighed 2,000 grams; pale yellow, soft, smooth, capsule glistening. Cut surface showed indistinct lobulation and some small pin-point hemorrhages.

Spleen: Greatly enlarged, weighing 1,000 grams and extending to the crest of the ileum. Capsule slightly thickened and showing hemorrhagic mottling beneath. Cut surface is deep red, showing large profuse dark brown mottled areas with smaller yellow areas in between. Some increase in the connective tissue stroma could be made out.

Kidneys: Left, weighed 750 grams; enlarged. Capsule thickened and splits off easily. There is a distinct hemorrhagic mottling over the whole organ, some of the spots being an inch or more in diameter, and the tissues between has a grayish yellow appearance--in fact, the kidney could not be told from the mass of tissue found in the mediastinum. On cut section the greater part of the kidney substance was found to be made up of this yellow homogeneous tissue with the red mottling; the cortex almost completely obliterated, except for one or two small areas where the striations could be indistinctly made out; the calices and the pelvis one solid mass. Most of the hemorrhage was in the pelvis and the cortex with the yellow mass between. The kidney was rather firm and of a peculiar elastic quality. Right, weighed 775 grams; other findings the same as left.

Pancreas: Normal.

Stomach: Hour-glass, punctate hemorrhages in mucous membrane.

Intestines: Hemorrhagic mottlings.

Bladder: Negative.

MICROSCOPICAL EXAMINATION.

Mediastinal tissue: This is made up entirely of lymphoid cells, scattered in a mesh work of delicate connective tissue stroma. Throughout there are large areas of fresh hemorrhage, in which many megaloblasts and nucleated reds can be seen under the oil of emersion. The lymphatic elements are all of the large mononuclear type, chiefly myelocytes; the eosinophylic myelocyte differentiated from the other two by the ordinary tissue stains.

Heart: Slight myocardial changes. Between the bundles there is an infiltration of lymph and red cells. The pericardium is completely obliterated and replaced by adherent mediastinal tissue.

Lungs: There is slight evidence of a general round cell infiltration within the alveolar walls; the spaces in small areas are filled with serum and "hertz fehler" cells. Scattered throughout the section there are small areas of lymphoid accumulations, made up chiefly of myelocytes, nucleated reds, and other large mononuclear cells.

Spleen: Capsule thickened. The splenic pulp greatly increased, the trabeculæ being widely separated by the large increase in the pulp tissue. The predominating cell throughout is the myelocyte; giant cells with budding nuclei and nucleated reds are also seen throughout the section. The general appearance is much like that of bone marrow. The follicles are fairly well outlined and show less change than is seen in the pulp.

Kidneys: Capsule thickened. The glomerular tufts are contracted away from their capsule, showing no increase in cellular elements, but some slight evidence of fresh hemorrhage. The convoluted and connecting tubules are widely separated, only pieces of them being made out and the lining epithelium showing marked parenchymatous degeneration. The greater part of kidney substance is made up of a deep blue staining cellular mass with areas of hemorrhage

CASE OF SPLENO-MYCLOGENOUS LEUKÆMIA.

FIG. 2 —PATIENT ABOUT TWO WEEKS BEFORE DEATH, SHOWING PURPURÆ OVER ABDOMEN AND ARMS, HÆMORRHAGES FROM THE MUCOUS MEMBRANES OF THE LIPS, AND EMACIATION.

scattered about. The high power shows this tissue to be made up of mononuclear cells, the same as found in the mediastinal tissue and splenic pulp. Myelocytes and nucleated reds are in abundance. This section is perhaps the most striking of all the tissues studied, the finding of a few normal remaining kidney structures embedded in a mass of myelocytes, megaloblasts, and nucleated reds making a very odd picture.

Liver: Here again there is a general lymphatic infiltration, masses of these large mononuclear cells being seen about the blood vessels and in the periportal spaces. The infiltration extends into the liver lobule, spreading the cell columns apart and breaking up slightly the normal arrangement of the gland. The mononuclear cell is chiefly of myelocyte type; nucleated reds also made out.

Pancreas: Normal.

Suprarenal: Normal.

CONCLUSION.

After having had the opportunity to study this case carefully at the bedside, clinically and pathologically, one can not help being impressed with the idea that this disease is of the malignant tumor type. The symptoms, the cause, and the invariable prognosis; the finding of cells, always the same in type, in organs where they are pathological, disseminated in masses throughout the whole system, with a pernicious anæmia resulting perhaps from the elimination of a cell toxine, are all strong indications, I think, for placing this disease, *sui generis*, among the malignant growths. The disease is primarily, most likely, in the red bone marrow, from which there is a general metastasis to the rest of the body.

A CASE OF RUPTURED ANEURISM IN THE VENTRICULAR SEPTUM WITH SUDDEN DEATH (A. E. L.).

——, G. F., p. m., 30 years 5 months old, was admitted on the sick list at Olongapo, P. I., September 27, 1907, complaining of cough and pain in his chest. On September 30 a mitral murmur was made out. On the night of October 2 the patient had a severe hemorrhage from the lungs with marked dyspnœa. He died October 3 while being transferred from U. S. S. *Pompey* to a launch for this hospital.

AUTOPSY.

Heart: Showed a marked hypertrophy and dilatation of all its walls, especially the left ventricle and auricle. Chronic pericarditis and myocarditis present. The visceral and parietal pericardium greatly thickened and adherent (organized adhesions). About 200 c. c. clear fluid in pericardial sac.

Valves: Those on right side showed no roughening and were practically normal; of those on the left side, the mitral were slightly thickened and relatively incompetent. The aortic valves showed a most marked degree of sclerosis, the calcareous deposits making them, in places, a fourth of an inch thick. Their mobility was absolutely gone, and they remained fixed as if made of stone. In

spots there were areas of beginning degeneration of the calcareous plaques. The slit-like opening made by the valves was not large enough to allow the point of a small silver probe to pass through. Just below one of the sclerotic cusps there was an ulcerating area in the septum wall of the left ventricle, which communicated, by a ragged-walled and degenerated sac (about the size of a large cherry) with the left auricle. There were no signs of repair having set in.

The pathological sequence of events in the case may be considered to have been as follows: The calcareous deposits extending down from the cusp on to the ventricular septum offered the weakest point of resistance to the excessively high tension within the ventricle, necessary to force the blood through the markedly stenosed aortic valves; the blood stream slowly forced its way through, forming the sac within the wall, and finally rupturing into the left auricle.

This last step was most likely the cause of sudden death.

The case is interesting in that it illustrates the course of a true aneurism within the heart itself.

CURRENT COMMENT.

[It is to be remembered that in the publication of these Comments the Bureau does not necessarily undertake to indorse the opinions expressed, but will lend the pages of this section to discussion of such contemporary topics as will be of interest and value to the service.]

BATTLE ORGANIZATION FOR THE MEDICAL DEPARTMENT ON SHIPBOARD.

By Surg. JOHN F. URIE, U. S. Navy.

Perhaps the most important problem before the naval medical officer to-day is that of preparing a plan of action that will efficiently meet the demands to be made upon him in the gravest work of his official life—the caring for the wounded on board ship in action.

It is a problem that has been given serious thought by medical officers of the navies of every country, and yet the difficulties of its solution are so many that in our service to-day we have no thoroughly satisfactory plan of action—no scheme that can be used as a basis of organization, applicable to all types of ships. In fact, it may be said we have no uniform organization at all. Each medical officer works out a plan for his own ship from his own point of view, influenced by the construction of the ship for which his plan is formulated and by the ease or difficulty he experiences in obtaining men and space for his work. It is the purpose of this paper, therefore, to endeavor to formulate a plan of organization that may be used as a foundation, at least, for uniformity throughout the service. To further this purpose study has been made of the theoretical work of others of our own service in peace, and of the practical experience in modern war of the Russians and Japanese.

From the analysis of this work and experience of others one deduction is drawn, upon which all seem to be in accord and which the writer's experience leads him to accept. It seems to be the consensus of opinion that not much more than protective surgery can be applied to the wounded in action during the actual engagement—practically nothing more than first-aid relief can be rendered, and it is upon this generally accepted fact that the plan here to be offered is based.

Accepting the principle, then, that the main efforts of the surgeon and his helpers in action must be directed along these simple lines, with a reservation that full provision must also be made for impera-

tive operative work, though this is of minor importance, a plan of action naturally resolves itself into the problem of providing means and methods.

RELIEF CORPS.

Without question the first and foremost step of this work is the removal of the disabled wounded to places of comparative safety, where protective and restraining dressings can be applied, and, incidentally, the withdrawal of the dead from the range of senses of those still in action. To do this in the most expeditious and least distracting manner means men, a considérable body of men, trained and drilled for the purpose. The assigning of this body of men to the surgeon's division as a permanent detail, to be trained and drilled for this duty in action, is the first and principal step in the organization scheme here advocated. The term "relief corps" is suggested as one to be applied to this company of men, and it will be so designated in this discussion.

From what source in the personnel of the ship's company may this corps be recruited? It is not necessary or wise to make up its numbers from the specialized men of the hospital corps. Such a large number of hospital corps men would be practically unemployed between actions and would take up valuable room. Besides, it would be a waste of their training to have them perform a duty which can be done to all intents and purposes as well by less trained people. Dependence must be placed, therefore, upon a detail of men from other departments, the duties of which have no direct connection with the actual fighting operations of the ship, and this detail must be a fixed one, not one man to-day and another one to-morrow, but the same men and the same number of men, as far as practicable, at all times. To obtain such a company of men from this source under the conditions of to-day gives rise to the first difficulty. The writer's experience on two of the latest types of fighting ships made plain the fact that every available man of the ship's complement as laid down was needed to carry on the actual fighting processes—manning the guns, providing ammunition, developing the motive power, directing and controlling the ship's movements, etc. At least, every man of the ship's complement was so assigned and complaints were heard that there was not a sufficient number to efficiently do this. The question then arises: Is it practicable and worth while to increase or rearrange a complement already laid down for the purpose of providing skilled and humane aid to those of our comrades stricken down in battle? Human life is cheap—perhaps nothing expended in the world's enterprises is more so; but there are other considerations in the question to which it would be wise to give attention. Would not the maintenance of the morale of the uninjured men still in action be better

assured by such care of the dead and wounded as above indicated? It may be that the well-drilled human being, trained to automatism, will enter a fight in no better trim with the knowledge that he is to be cared for if rendered helpless by wounds than if he knows he is to be allowed to perish. Be this as it may, at the outset, it is certain that the fighting morale of even a drilled personnel can not be maintained long if the wounded and dying are neglected and left within range of their senses to unnerve by a suggestion of what may be their own fate.

If for no other reason than to promote the success of the ship in action, is it not worth while? History is replete with countless naval engagements in which the fighting was done on decks slippery with gore and among the dead and dying, but were the best results obtained under such conditions? It would seem as if success or failure of battle afloat, under modern conditions of immense mechanical forces pitted against each other, depends largely, if not wholly, upon the skill and precision with which these forces are controlled and directed. The personal element always has been and probably always will be the dominating factor. Next in importance to the efficient training of this element comes the need to maintain the developed efficiency upon a plane of steady effectiveness—to maintain an unbroken automatism by every provision at our command—and among the important means to this end stand the proper care and prompt removal from the scene of action of those killed and wounded.

Another important reason why the best plan possible for the relief of the wounded should be adopted, cost what it may, is that we are responsible to a sovereign people whose interest in the individual of the naval service is more or less a personal one, and who will countenance nothing but the best for his care and protection when rendered helpless in the defense of the common country.

Granting, then, that a detail of men from the ship's complement to form a relief corps is both practical and necessary, the question as to the number required for efficient service calls for first consideration, but there are few records of experience to guide in reaching conclusions. The most valuable source from which lessons in this matter and others associated with it can be derived is, of course, the record of observations during the Russo-Japanese war—the last and practically only war of this era in which naval engagements were conducted on a scale of modern proportion. From the accessible records it is learned that, considered from our standards, the Japanese were liberal in their allowance of men to aid the wounded. On a first-class battle ship from 40 to 50 men were so assigned, practically 5 per cent of the ship's company. On the Russian vessels of which we have any knowledge there seemed to be no uniform ar-

rangement. On vessels of the *Gromoboi* class, carrying a thousand men, it is recorded that 10 aids to the wounded were regularly detailed. On the *Bayan*, a cruiser, 20 men were so assigned. It is reported that the dead were often thrown overboard from the Russian ships during action. To-day the Japanese organization appears to be, as at the end of the war, largely based on their experience in actual battle service, and it would seem as if the study of this organization offered the best promise of profit. It is wise to keep in mind, however, that any plan devised for our service must meet conditions peculiar to that service, conditions of ship's structure, conditions of temperament, character of social development and training of our personnel, and conditions of responsibility to a government of the people.

The safest, best, and most practicable basis upon which to establish the number of men necessary to the formation of a sufficient relief corps for a given ship would seem to be to fix upon a certain percentage of the ship's complement. The Japanese gave up 5 per cent of their force to this purpose, and their testimony is to the effect that, in any action of importance, it was none too large. From the point of view of what has been done in the past in our service, 5 per cent would seem to be a large number of men out of a ship's company to assign to noncombatant duty. But figuring on a basis of 2 men for each gun of the main battery, with a small allowance for the secondary batteries, ammunition force, navigator's division, and engineer's department, practically the same figures will be reached. Six per cent has been worked out as the number of men needed to care for the wounded and sick of an army in the field, but this represents the whole number to be applied to all purposes and details in connection therewith. Can efficient work in a serious engagement be accomplished with less? Considering the frightfully destructive action of modern ordnance and the possibility of casualties among members of the relief corps, it would seem that a proportion of 5 to 95 is not an excessive one. It is recognized, however, that conditions might, and probably would, arise which could not be met promptly by any force or organization that it would be practicable to provide.

Differences in the construction of ships, of arrangement of batteries, of amount of protection, etc., make the problem, in a measure, one to be worked out for individual ships. But, for the purpose of a basis of action and as a tentative provision, it is believed that a 4 per cent allowance of a ship's company is the least number with which it is safe to begin.

Accepting this number, then, as that to be adopted, from what divisions of a ship's company can the men be drawn? We are told that the Japanese assigned their mess men, cooks, stewards,

bands men, fire brigade, and rope repairers to duty as carriers of the wounded during action. In our Navy men of these ratings are employed in furnishing ammunition to the batteries. Can our ship's companies be augmented to provide specialized ammunition men and allow the above mixed group to the relief corps? This is a question, of course, to be decided by those under whose direction the fixing of and assignment to stations properly fall, but it is believed to be one of enough importance to warrant careful consideration.

As the main reliance of the surgeon during engagement and as the first essential of the organization for his department to meet the above-mentioned simple demands for aid at such a time, this detail of non-combatants should, as said before, be a fixed one—the same men and the same number of men at all times. These men so detailed should be given a training as thorough and systematic and as frequently repeated as is given to the other divisions of the ship's company in their particular duties in action. The instruction should be along the simplest lines—protection of wounds from contamination, importance of the least interference compatible with protection, the meaning, importance, and control of hemorrhage, artificial respiration, and, last, though of first importance, the means and methods of transporting the wounded and disabled in the most expeditious and least harmful manner. This means repeated drill and instruction—no more, no less.

In the distribution of the members of the relief corps during action the peculiarities of each ship will necessarily have its influence. Whether it is wise or not to so station them that in order to be near the probable field of casualties they are themselves exposed to fire is a question. The Japanese worked out the problem, after suffering many severe casualties in their relief corps, by keeping them under cover in different parts of the ship until a call for their services was made. It would seem to be rational to have the members of this corps distributed in groups, the greatest number near the most probable zone of danger, keeping under protection as far as possible. Inaccessible compartments, as turrets, secondary batteries stationed outside the citadel, engine room, fireroom, etc., should be furnished with a proportional number of relief-corps men equipped for independent work.

Again, it is a question whether or not first-aid relief should be given at the scene of injury, except, of course, to those who are inaccessible to the surgeon's care and to the minor wounded. To refer again to Japanese experience, it was found by them that it was not to the best interest, either of the wounded or those serving at the batteries, to apply first aid on the spot. No damage was done to the wounded by the exposure incident to transportation with undressed wounds, and the better care received when finally given

attention at a dressing station more than compensated any risk attending the short delay. The writer is strongly of the opinion that the best service the relief corps can give—both to the wounded and in furthering the success of the ship in action—is to remove the incapacitated and dead in the most expeditious manner possible from the proximity of the fighting operations. Of course, now and then there would occur casualties, such as dangerous hemorrhage and exposure of viscera, etc., requiring immediate attention; but, I repeat, the main efforts of the relief corps should be expended in removing the disabled quickly and skillfully.

DRESSING STATIONS.

Next in importance to the organization of a numerically sufficient and efficiently trained relief corps comes the location, number, and character of dressing and relief stations. Minor wounds, as heretofore, will either be ignored by the person afflicted or cared for on the spot by himself or a comrade, and it will be necessary, only, to see that the material for first aid under such conditions is so placed and of a character to do the most good and that it is provided in liberal quantities. It is the writer's opinion, after some experience and more study of the subject, that the establishment of secondary stations, sometimes called relief stations, is not a practical plan and may work for evil. Isolated stations of this character, out of reach of the control and guiding knowledge of a medical officer, offer occasion for the neglect of serious injuries, would probably mean waste of dressings and supplies, and might possibly furnish a pocket in which some of the relief-corps men and the minor wounded, able to continue service, would collect. Records of the Japanese experience seem to indicate that the relief-station plan was not a good working one with them. The same character of relief can be given to the men at their duty stations as at the relief station. A liberal supply of first-aid dressings within the reach of the different gun crews and other divisions will constitute ample provision to obtain satisfactory results in those minor wounds and at the same time will be a means to insure the retention of able men at their posts of duty. Those whose wounds can not thus be taken care of are fit subjects for the skilled attention of the medical officer and should be taken to one of the main dressing stations. A relief corps, as suggested in this paper, to rapidly bring in the disabled wounded, and two dressing stations, one fore and one aft, in the roomiest and most accessible compartments within the zone of protection, will meet, it is believed, all the conditions that can be practically met in action.

The advantageous location of these stations is another question, which on the majority of the ships of our service is almost unan-

swerable. It can not be said that there is any available place that can be utilized to good purpose. A makeshift of little or no practical use is the only accommodation. Wardroom, laundries, petty officers' mess, and sleeping quarters—indeed, one or another of any of the various spaces found within the citadel on the different protected ships, without particular regard to their adaptability to emergency hospital purpose—have been assigned to the surgeons in which to do the delicate work of his profession, and at a time, too, when he needs the best that can be afforded. As a rule, the spaces so assigned are not prepared in any way to be quickly turned to the purposes of surgical procedure. Rarely is it undertaken to work out the problem connected with the furnishing of proper light, of steam fittings for sterilizing plant, of shelving for dressings and appliances even after the space is assigned. Reliance seems to be wholly placed on the equipment that can be furnished from the sick bay, operating room, and storeroom supplies. How many of the spaces assigned to the purpose of main dressing stations in action on the vessels of our service are furnished with steam connection for attachment to the sterilizing equipment, the main reliance of the surgeon to-day for good surgical results? How many of them have anything but the most tortuous avenues of approach and departure? How many of them have in their neighborhood any space available or that can be made available for the laying aside of the wounded until the action is over? These questions are not asked in any spirit of criticism, but wholly with the motive of bringing to attention the regretable conditions under which the wounded would have to be treated in action and with the hope that some way of correcting and improving existing methods may be discovered.

The fault would seem to lie in the fact that, in the development of the ship's structure—in the evolution of the plans—the question of providing space for the care of the wounded in action is not given consideration or, if considered, is not deemed of enough importance or sufficiently practicable to work out. It would seem, however, to be wholly feasible, without making any greater demands on ship's space than at present to plan two spaces of sufficient size within the protected area, where such is a part of a ship's structure, giving due consideration to channels of approach and exit from them for the convenient transportation of the wounded, and arranging the neighboring spaces with a view, more or less, to their being utilized for the purpose of comfortably laying out the wounded, pending the final outcome of the action. These dressing stations should be partially equipped—portable racks and shelves adjusted to the bulkheads; water and steam connections for sterilizers and boilers, etc., fitted, and a sufficient number of electric bulb sockets installed, so

that everything may be ready for application to surgical purposes when action is imminent. At other times these spaces could be utilized for paymaster's or ship's stores, or as might be demanded by the dominant interest of ship's economy. The writer earnestly believes that the time to give the subject serious consideration is when the plans of a ship are laid down, and not when the finished structure goes into commission or even, as may be, when war is declared.

Given that two such places as described are available, there should be stationed in them the skilled medical staff of the ship, at least one medical officer at each, assisted by the hospital corps men of the ship's complement, the relief corps being the connecting link between the surgeon and the crew in action.

TRANSPORTATION.

It is probable that no one method of transportation can be adopted for any type of ship or any one ship. The intricate character of ship construction will call for the employment of every form of conveyance that the ingenuity of the medical officer can devise. It has been the experience of all who have worked on this problem that main reliance must be placed on hand methods as the safest, most generally applicable, and most expeditious, utilizing the different forms of stretchers, issued and improvised, for special conditions, as, for example, where hatches with leads to the dressing station are available. On some foreign vessels elevators have been installed with more or less success. It goes without saying that the relief corps should be thoroughly drilled in all transportation methods applicable to the type of ship on which it is serving, stress always being laid upon hand methods.

EQUIPMENT.

In the equipment of the dressing station consideration must be given to the character and amount of work which will probably have to be done, the surroundings in which it must be done, and the need of expedition compatible with safety in meeting all calls for relief. The main work of the stations will consist in the skilled application of protecting and restraining dressings, the relief of pain and shock, the control of hemorrhage, and the repair of damage already done by hemorrhage. This does not suggest a very elaborate equipment. A generous supply of sterile dressings and water, with means at hand for the preparation of more, of hemostats and ligatures and a few other commonly used instruments, saline infusion apparatus and stimulants are indicated. Of course, a certain amount of operative surgery will be imperative during action when life is at stake, in anticipation of which provision must be made at the dressing stations by transferring so much of the contents of the operating room or the equipment which takes its place on small ships as may be

of practical use. All the surgical and medical equipment of the ship that can not be used to advantage in the protected dressing station should be stored below the water line in the storeroom or given what protection from destruction by gun fire the ship affords. As this paper is meant to consider the subject of organization broadly, the lesser details of equipment, provision for additional light, for cleanliness, and general administration will not be discussed. The subject of equipment is only considered to bring out the fact that simplicity should characterize the work of the dressing stations.

It is believed also that every ship in commission should be allowed a large reserve supply of dressing material, put up in small protected packages to facilitate transportation and sterilization, to be considered as equipment for action and not part of the normal supply. A liberal allowance of first-aid packets, at least one for every individual of the ship's company, with containers for 20 or more packages made of metal or canvas, designed to be hung in a place accessible to the different divisions of the ship's complement, should be a part of the allowance table. Such ample provision near the guns and elsewhere as indicated would obviate the need of establishing and equipping relief stations. It is the writer's opinion that any wound calling for a more extensive dressing than can be given by the first-aid packet incapacitates the victim of it for further immediate duty and calls for attention at the dressing station.

RECAPITULATION.

The sum total of this paper may be condensed in a few words. A uniform battle organization for the medical department on shipboard depends upon: First, the establishment of a relief corps of from 4 to 5 per cent of the ship's complement; second, the establishment of two dressing stations, protected when possible and equipped for all probable demands, which should be designed and built for the purpose; third, the abolishment of all so-called relief stations and the substitution of a liberal supply of first-aid dressings placed at different points about the ship where they will be easily accessible to the members of the crew, who are to be instructed in their application; and, fourth, the furnishing of a large reserve supply of dressings and appliances.

PHIMOSIS AS A CAUSE FOR REJECTION OF RECRUITS.

By Passed Asst. Surg. B. F. JENNESS, U. S. Navy.

Since the introduction of the segregation system into our training stations the diseases "existing prior to enlistment" are being more rapidly eliminated from the ranks of recruits who arrive from the

various recruiting offices throughout the country. Under this system a more thorough and careful examination than that given at the recruiting stations is possible, and the period of observation of the apprentice in the detention barracks is conducive to the discovery of existing, disqualifying defects not at first apparent, and to the development of latent diseases which might endanger the health of station if precautions were first taken only when the communicable disease clearly manifested itself. Thus the recognition of the possibility of contagious diseases among recruits and the anticipatory isolation of cases and the separation and survey or treatment of the less physically fit, such as men having hernia, varicocele, or defective vision, etc., is a vital and important part of the work to be done at training stations. Such reexaminations and periods of observation are undoubtedly filtering from our service the physically weak and disabled, as well as the infectious, and are raising the standard of our men and reducing the survey and pension lists of the future.

There is one condition, however, which, though extremely common among recruits, is not set down as a cause for rejection in the naval service, and is seldom questioned by the examining surgeon, either at the recruiting station or the detention barracks. This condition is congenital phimosis—an abnormality which, as a precursor of venereal disease, is one of the most important factors in the medical record of our seamen. Hypospadias, epispadias, hernia, varicocele, and defective vision are all stated causes for rejection, and yet phimosis—a condition of equal if not greater importance in the cause of future disability, is disregarded. Unless a phimosis is marked enough to interfere with urination, or presents other subjective symptoms at the time of examination, nothing more than advice regarding the possibility of future circumcision is given, and the recruit carries the condition into active service, where, as a seaman, he is soon launched upon the sea of venereal experience to suffer the complication of phimosis with any venereal disease he may contract.

Phimosis is primarily unsanitary, particularly in military life, where bathing facilities are often not of the best and do not insure privacy. If retraction is difficult or impossible, the necessary cleaning of the part is neglected and it is the source of balanitis, which under the circumstances is not only difficult to treat, but is often mistaken for chancroidal infection, and so entered in the medical journals. It is believed that many cases of chancroid follow a simple balanitis as a result of phimosis. The secretion into the warm space around the glans and beneath a tight prepuce becomes in this condition a fertile culture medium which is beyond the reach of ordinary cleansing procedures, and when infected the bacteria grow rapidly in numbers and virulence and attack the congested and abraded surface.

Had the glans in such cases been exposed and treated, or even washed after copulation, it is reasonable to suppose that the streptobacillus of Ducrey, if this be the cause of chancroid, would have been destroyed or removed and no diseased condition from such infection occurred.

Little need be said of the clinical importance of phimosis in relation to syphilitic infection. The difficulty in treating, the operation of slitting the foreskin, the early appearance of bubo, and the danger of paraphimosis and phagedenic ulcer are all familiar and dreaded features of venereal diseases in the presence of phimosis. Cases which with a retractible foreskin would have been of simple nature become most complicated and filthy when phimosis is present. Nor does this complete the picture, for the future of these cases is burdened with distressing sequelæ. Circumcision can not be performed while the prepuce is swollen and, perhaps, reeking with pus or riddled with ulcers, and the incision to expose the glans and treat the disease beneath, while often necessary, lays the foundation for further trouble. These cases are of frequent occurrence in naval practice, and many of them follow a tedious and protracted course requiring weeks of treatment and repeated operations. When they do finally recover from the effects of the infection, it is usually with remnants of cicatricially retracted, twisted, and deformed or redundant and thickened foreskins, upon which circumcision can not be properly performed, and the patients, finding intercourse unsatisfactory or erection difficult, then apply for circumcision.

Could not much of this venereal invalidism of our seamen be eliminated by viewing phimosis in the light of a physical disqualification, as are hernia and large varicocele, which are not only causes of rejection at the recruiting offices but in the detention barracks lead to survey and discharge from the service unless the apprentice consents to an immediate operation? If recruits with phimosis were given the option of operation or discharge, it is believed that venereal complications in the service would be speedily reduced in number and severity. Men already in the service with this deformity would, in the majority of cases, submit to operation if the increased dangers of venereal disease were presented to them. Then, if inspections for phimosis were made and operation performed at a suitable time, our venereal lists would be still further reduced and the men would be healthier and happier in the performance of their duties.

PROGRESS IN MEDICAL SCIENCES.

LABORATORY.

OLLULANUS TRICUSPIS IN STOMACH CONTENTS OF CAT.

Surgeon E. R. Stitt, U. S. Navy, reports from the U. S. Naval Medical School that "While making an autopsy of a cat during one of the laboratory periods in Doctor Stiles's course in animal parasitology Passed Assistant Surgeon Butler noticed large numbers of what appeared to be round worm embryos in the stomach contents. These parasites were identified by Doctor Stiles as "*Ollulanus tricuspis*." The male is about 0.75 m. m. and the female about 1 m. m. long. The male has a copulatory bursa which has rather a corrugated appearance. The female is a very striking object, owing to the presence of one or two curled-up embryos, which in their oval form are almost as wide as the parent. They measure 45 x 22 u. Newmann ("Parasites of Domesticated Animals," p. 315) states that in numerous autopsies of cats he has never met the parasite. Doctor Stiles states that he has no record of its having been previously reported from the United States."

THE PANCREATIC REACTION IN THE URINE (CAMMIDGE).

By Passed Asst. Surg. H. W. SMITH, U. S. Navy.

Within a few years inflammatory diseases of the pancreas have assumed an importance commensurate with those accorded affections of the stomach, duodenum, and liver. A few men have directed attention to the frequency of pancreatitis and its association with other diseases of the upper abdomen, particularly affections of the gall ducts, and the work of Mayo Robson and Cammidge has given us a simple and apparently reliable tests whereby we can diagnose pancreatic sclerosis almost from its inception as an inflammatory process of varying genesis. Chronic pancreatitis seems especially common in the Tropics, and certain observations connect it with the condition known as "Sprue."

Besides the Cammidge reaction in the urine, the examination of the stools for evidence of impaired digestion is important. The

only treatment of benefit is prolonged drainage of the biliary passages, together with a strict diet of modified milk.

A brief description of the Cammidge reaction by Hospital Steward R. W. King, U. S. Navy, follows:

To 40 c. c. of the previously filtered and perfectly clear urine contained in a 100 c. c. Erlenmeyer flask add 2 C. P. concentrated hydrochloric acid and boil gently on a sand bath for ten minutes. (A small funnel should be placed in the neck of the flask to prevent excessive loss by evaporation.) The flask is then cooled in running water and the contents made up to 40 c. c. with distilled water and poured into a small beaker containing 8 grams of carbonate of lead, allowed to stand for about five minutes, stirring constantly, and then filtered through a well-moistened paper into a small beaker containing 8 grams of tribasic lead acetate, which, after being well mixed, is again filtered into a beaker containing four grams of sodium sulphate. The filtrate containing the sodium sulphate is heated to the boiling point on the sand bath and then cooled to the lowest temperature possible by placing the container for several minutes in a vessel of running water; it is then filtered through a well-moistened paper until perfectly clear. Ten c. c. of the filtrate are made up to 17 c. c. with distilled water and poured into an Erlenmeyer flask containing 1 c. c. of 50 per cent acetic acid, to which is then added 0.75 gram of Phenylhydrazine hydrochlorate and 2 grams of sodium acetate; the contents of the flask is now gently boiled on the sand bath for ten minutes, using funnel condenser to prevent excessive evaporation, and then filtered through a paper moistened with hot distilled water into a marked test tube and the volume made up, if necessary, to 15 c. c., and allow to stand for twenty-four hours, unless a positive reaction develops sooner.

A microscopic examination of any sediment which may appear should be made, the presence of characteristic yellow crystals (sheaths and rosettes) resembling phenyl-glucosazone being interpreted as a positive reaction.

Control.—It frequently happens that a trace of sugar is present in a urine, which gives no response to Fehling's test, and, since in cases of this kind the Cammidge reaction would be misleading, it is advisable to do a blind test on the urine at the time of doing the Cammidge. For this purpose 10 c. c. of the perfectly clear previously filtered urine are made up to 17 c. c. with distilled water and the phenyldrazine test carried out exactly as directed for the Cammidge reaction. Should the control test show crystals of phenylglucosazone, the urine must be fermented before the Cammidge reaction can be relied upon. In case the urine has been fermented, the control may, of course, be dispensed with.

THE DETECTION AND DETERMINATION OF METHYL ALCOHOL AND FORMIC ALDEHYDE—THE ACID PHASE OF THE BIURET REACTION.

By Hospital Steward R. W. King, U. S. Navy.

This represents original work carried on in the laboratories of the U. S. Naval Medical School, Washington, D. C.

The following reagents will be required: Solution of hydrochloric acid, made by diluting 25 c. c. of c. p. hydrochloric acid (sp. gr. 1.20) with sufficient distilled water to make 200 c. c. Solution of potassium permanganate, made by dissolving 0.2 gram of potassium permanganate in 200 c. c. of distilled water. A 1 per cent aqueous solution of oxalic acid. Reagent "A," made by adding 1 c. c. of Fehling's cupric sulphate solution to 400 c. c. of c. p. hydrochloric acid (sp. gr. 1.20). Reagent "B," made by adding 1 c. c. of Fehling's cupric sulphate solution to 100 c. c. of c. p. sulphuric acid (sp. gr. 1.84).

The detection of methyl alcohol in pure acqueous solution is, of course, attended by no difficulties. When present in quantities ranging from 25 per cent to one part in 25,000 of water its presence may be easily and quickly demonstrated by the following method: Fifty c. c. of the fluid containing, preferably, not more than 10 per cent of methyl alcohol are placed in a 200 c. c. Erlenmeyer flask containing 5 grams of pure sodium chloride. When the salt is dissolved, 5 c. c. each of the solutions of potassium permanganate and hydrochloric acid are added, and the contents of the flask quickly heated over the flame until well-marked boiling begins. At this point 5 c. c. of the oxalic solution are immediately added, and the flask cooled in a stream of running water, and when cool 0.1 gram of Witte's peptone added. The fluid is then tested for formic aldehyde as directed below.[a]

Test for formic aldehyde.—Five c. c. of the fluid are poured into a perfectly clean Nessler's jar and an equal amount of reagent "B" added. The reagent should be poured directly into the fluid in such a way as to insure thorough mixing. In the presence of methyl alcohol a violet color will appear immediately on mixing the reagent with the fluid. In the absence of methyl alcohol a yellowish brown color is formed. In this reaction the violet color produced by the methyl alcohol (formic aldehyde) appears immediately, never later than one or two minutes, and any slight reddish violet coloration that may appear after longer standing should be ignored as being due to decomposition products of the peptone. The Nessler's jars used in

[a] The solution should be tested for formic aldehyde within one hour after the addition of the peptone, otherwise decomposition products of the proteid may give a slight pink or reddish coloration which will simulate that produced by very minute traces of formic aldehyde. The solution may of course be kept indefinitely, provided the peptone is not added until the formic aldehyde test is to be applied.

the test should be allowed to stand on a sheet of white paper, as the color is then seen to the best advantage.

Salts of the heavy metals may interfere with the test if present in very large amounts. If such solids are known or suspected to be present in more than traces, they should be removed before the oxidizing process is begun. This may, of course, be done by distillation, but the following method is recommended as being more convenient: Fifty c. c. of the fluid are made distinctly, but not strongly, alkaline with sodium carbonate, then allowed to stand a minute or so and filtered through a double filter until perfectly clear. The filtrate is then treated as directed for a pure aqueous solution containing methyl alcohol. In case the fluid is already alkaline, it should be made faintly acid with hydrochloric acid and the alkaline reaction restored with sodium carbonate; the fluid then filtered and treated as above. The object of this last course is the removal of barium, calcium, etc., should they be present in considerable quantities. Nitrates and nitrites, if present in more than traces, must be removed by distillation, since their presence interferes with the test for formic aldehyde by giving a bright yellow color, due to a substance which either prevents or conceals the reaction produced by formic aldehyde.

The presence of sugar and other organic material of a similar nature will interfere with the oxidation of the alcohol, as well as conceal or prevent the reaction due to formaldehyde. If such compounds are suspected to be present, the fluid should always be distilled. The presence of organic compound that can be removed with basic subacetate of lead may, however, be removed in this way, the lead being afterwards removed by the addition of sodium carbonate as directed above.

The presence of albumens will interfere with the test by preventing the proper oxidation of the alcohol. As the removal of these substances by distillation is a tedious and often difficult process, it is advisable in all such cases to precipitate the albuminous material as completely as possible by means of sodium chloride, the method used being similar to that recommended for stomach contents. (See below.) It is desirable that the solution to be examined should not contain much more than 10 per cent of sodium chloride, although it is not thought that the presence of considerably larger quantities will seriously interfere.

The presence of coloring matter, ethereal oils, and similar substances will often, if not always, interfere with the test for the detection of methyl alcohol, and in all cases where there is any probability of their presence the solution that is being examined should, as a precaution, be subjected to the following preliminary test before the oxidizing process is begun, as it will often show the presence of interfering substances which would not otherwise be recognized. The

fluid being examined for methyl alcohol is treated as directed elsewhere for the removal of such interfering substances as are known to be present and 5 c. c. of it placed in a small porcelain dish or Nessler's jar containing a small amount of Witte's peptone and 5 c. c. of reagent "B" added. If, when treated in this way, the mixture assumes a dull yellow or faintly reddish brown color, it is probable that coloring matter and many other organic substances are absent; if, however, the fluid becomes distinctly red or assumes any other color than those mentioned above, it indicates that interfering substances are present, and it will be advisable to remove them before proceeding with the test, as otherwise the results may be unsatisfactory and misleading. The method to be used for the removal of these interfering substances will depend on the nature of the fluid.[a] Should the color produced by this preliminary test indicate the absence of interfering substance, 50 c. c. of the fluid are treated as directed for a pure equeous solution. The fluid should be deeply colored by the addition of the permanganate of potassium, and the color should not change to brown before the application of heat; should this occur it will indicate the presence of substances, probably organic, which will prevent the proper oxidation of the alcohol. No attention should be paid the discoloration that only occurs on the application of heat, since this will frequently happen in the absence of interfering substances.

Detection of methyl alcohol in ethyl alcohol.—Various methods have from time to time been proposed for the detection of methyl alcohol in the presence of ethyl alcohol. Speaking generally, it may be said that all the simpler ones are more or less unreliable, while the reliable ones are too complicated for general use. It is thought the method here given is as simple, delicate, and reliable as can be desired. Five c. c. of the alcohol (95 per cent), or an equivalent amount of dilute alcohol, are made up to 50 c. c. with distilled water and treated exactly as directed for a pure aqueous solution containing methyl alcohol, except that the addition of the sodium chloride is omitted. The test for formic aldehyde is, in this instance, carried out as follows: Five c. c. of the fluid are poured into a perfectly clean Nessler's jar and an equal amount of reagent "B" added. Thirty seconds after the addition of the reagent the jar is filled to the mark (50 c. c.) with water. In the presence of less than 1 per cent of methyl alcohol a faint but distinct reddish-violet color is formed. When the amount of methyl alcohol present is greater than 1 or 2 per cent the color produced is a pure bluish violet, while in the absence of methyl alcohol

[a] If the solution being tested in this way does not contain sodium chloride, it will be advisable to add 1 c. c. of a saturated solution to the 5 c. c. of fluid before the reagent added.

the fluid remains colorless.[a] The violet color produced in this reaction is not permanent, but will gradually fade and disappear entirely after standing from thirty minutes to several hours, depending on the amount of methyl alcohol present. While the fluid is at first colorless in the absence of methyl alcohol, it may assume a brown tint after standing a few minutes. The violet color produced by the methyl alcohol appears immediately on or before the addition of the water. This test is much more easily and quickly carried out, and is thought to be much more delicate and reliable than the test recommended by the U. S. P. It is capable of detecting with absolute certainty the presence of 1 per cent of methyl alcohol in ethyl alcohol within ten minutes. It is a well-known fact that formic aldehyde is produced by the oxidation of ethyl alcohol of acknowledged purity, and for this reason it is necessary that the fluid being examined shall not contain more than 10 per cent of ethyl alcohol. The process here given provides for this, and in doing so securely guards against this source of error, and if the simple directions are followed the results, it is believed, will be entirely trustworthy, as they have been thus far at the Navy Medical School laboratory.

The detection of methyl alcohol in bay rum.—Five c. c. of bay rum are made up to 25 c. c. with distilled water and poured into a flask containing 0.5 gram of dried egg albumin; five drops of the hydrochloric solution are added and the flask allowed to stand, with frequent agitation, until the albumin is dissolved: this will require not longer than ten minutes. Ten grains of sodium chloride are now added, and when almost entirely dissolved the flask is heated until the first signs of ebullition are detected. It is then cooled in running water and filtered until perfectly clear; this is done by pouring the first 5 or 10 c. c. of the filtrate back onto the filter. The flask is rinsed with about 10 c. c. of water and the washings poured on the filter. The first 25 c. c. of the clear filtrate are made up to 100 c. c. and poured into a flask containing 1 gram each of animal charcoal and calcined magnesia, which is allowed to stand, with occasional agitation, for one hour: it is then filtered through a double filter until perfectly clear, the first 10 or 15 c. c. being returned to the filter. Five c. c. of the filtrate are then tested as directed above (see preliminary test), and if the reaction indicates, as it probably always will, that interfering substances are absent, the first 50 c. c. of the fluid are treated as directed for a pure aqueous solution, with the exception that the sodium chloride is not added. In the presence of 5 per cent or more of methyl alcohol, the formic aldehyde test will give an intense violet color immediately on mixing

[a] The jars should be allowed to stand on a sheet of white paper.

the reagent with the fluid. The presence of smaller quantities than 5 per cent may be detected in this way; but occasion for doing so will probably never occur, since if methyl alcohol was used in the preparation of the bay rum, it is not likely that less than 5 per cent would be present. This method, while especially intended for the detection of methyl alcohol in bay rum, will probably be found satisfactory for similar preparations, as flavoring extracts, etc.

The detection of methyl alcohol in stomach contents.—If the gastric contents are colorless and free from the odor of whisky, bay rum, volatile oils, etc., and there is reasonable certainty that sugar and similar organic compounds are absent, the following method may be employed: Twenty-five c. c. of the fluid, or a smaller amount if necessary, made up to 25 c. c., are filtered into a flask containing 5 grams of sodium chloride and enough of the hydrochloric-acid solution added to give a distinct acid reaction; five drops will usually suffice. When the sodium chloride has completely dissolved, the flask is heated until the first signs of boiling are detected; it is then cooled in running water and filtered through a double filter until perfectly clear.[a] It is then made up to 55 c. c. with distilled water, and 5 c. c. of it tested by pouring it into a small porcelain dish containing a small amount of peptone, and adding 5 c. c. of the "B" reagent. If a yellow or brown color develops it indicates the absence of sugar, coloring matter, etc., and the remaining 50 c. c. of the fluid may then be treated as directed for a pure aqueous solution containing methyl alcohol, omitting the addition of the sodium chloride.

This test is capable of detecting one part of methyl alcohol in more than two thousand parts of stomach contents. Ethyl alcohol will render the test less delicate, but unless present in quantities greater than 20 per cent it will not materially interfere. It is, of course, a remote possibility that ethyl alcohol will be found in the gastric contents in quantities sufficiently large to interfere with the test, but should the odor indicate the presence of an excessive amount, the difficulty would be overcome by using a smaller quantity (as 10 c. c.) of the fluid for the test.

The detection of methyl alcohol in stomach contents in the presence of bay rum and similar preparations.—Twenty-five c. c. of the stomach contents, or a smaller amount made up to 25 c. c., are filtered into a flask containing 0.5 gram of dried egg albumin and treated as directed for the detection of methyl alcohol in bay rum.

[a] Should the filtrate not be perfectly clear after the first 5 c. c. are returned to the filter, it will probably indicate the presence of other interfering substances than albumin, and in such cases the filtrate should be made up to 100 c. c. and poured into a flask containing 1 gram each of animal charcoal and calcined magnesia, and treated as directed for the detection of methyl alcohol in bay rum.

Experiments made on artificial gastric juice show that the presence of 0.25 c. c. of methyl alcohol can be detected in 25 c. c. of the fluid which contains 20 per cent of bay rum. It is advisable that if the bay rum is present in the fluid in larger amounts than 20 per cent to use only 10 c. c. for the test. It is in cases of this kind that the preliminary test recommended above is especially desirable, and the permanganate and hydrochloric acid should never be added to the fluid to be tested until the test shows the absence of interfering substances.

The presence of a large amount of whisky will seriously interfere with the tests for methyl alcohol; in such cases the best results will probably be obtained by treating the fluid as directed for bay rum and adding 1 gram of kaolin along with the animal charcoal and magnesia. If after standing one hour the filtrate gives a bluish or red color with the preliminary test, more of the charcoal and magnesia must be added and the flask allowed to stand until the interfering material is removed. It is probable that a more satisfactory method will be found for the detection of methyl alcohol in whisky after further experiments. Stomach contents that is being examined for methyl alcohol should not contain more than 20 per cent of whisky, or, if it does, a smaller amount (as 10 c. c.) of the fluid should be used for the test. Neither whisky nor champagne will likely be present in the stomach of those suspected of having imbibed such fluids as shellac, bay rum, denatured alcohol, and similar preparations, which are likely to have contained methyl alcohol.

Methyl alcohol in solutions other than those mentioned above (gastric contents containing sugar or soluble carbohydrates will come under this class) may usually be detected by the following method: Twenty-five c. c., or a smaller amount if necessary, of the solution are filtered into a flask containing 0.5 gram of egg albumin (dried), and enough of the hydrochloric acid solution added to give a distinct acid reaction. When the albumin is dissolved 10 grams of sodium chloride are added, and when almost dissolved the flask is heated until boiling begins; it is then cooled in running water and filtered. The filtrate is made up to 50 c. c. and distilled, the first 20 c. c. of the distillate being poured into a clean flask containing one-half a gram of dried egg albumin, which is then treated as directed for the detection of methyl alcohol in bay rum.

It is obvious that the tests above given for methyl alcohol would be useless and misleading if the fluid being tested contains formic aldehyde before the oxidizing process is begun: it is therefore advisable to always be assured of its absence before the potassium permanganate is added. If the preliminary test is always carried out as directed no error will result from this source.

The detection of formic aldehyde in aqueous solutions.—The method recommended for the detection of formic aldehyde in the methyl alcohol tests is original, so far as the author knows. It has not been thought worth while to investigate the literature on the subject, since the object in writing this article is simply to call attention to what is thought to be the simplest and most delicate test known for formic aldehyde. If the method is known at all, it certainly is not generally known, and this is a sufficient reason for its appearance in this place. It is true that Richmond and Boseley are quoted by Allen (Vol. IV, p. 193) as having attributed the reaction produced by Hehner's sulphuric-acid test for formaldehyde to the proteids of the milk. Hehner, after investigating this statement, reported that such, apparently, was not the case, as he was unable to get the reaction with peptone, while with egg albumin the response was so slight as to lead him to attribute it to the impurities present rather than the albumin itself. That these negative conclusions were accepted is shown by the fact that all text-books which treat on the subject recommend the addition of milk to the fluid to be tested for formic aldehyde by Hehner's reagent; this can only be accounted for by supposing it to be generally admitted that the same results could not be obtained by the addition of albumin or peptone, as the latter would certainly constitute a more convenient method.

The result of a number of experiments made prior to a knowledge of the above controversy proved that not only did egg albumin and peptone both give the reaction, but that they constituted one of the most delicate tests in the whole range of chemistry, being capable of detecting one part of formic aldehyde in more than 5,000,000 parts of water. To apply the test, place 5 c. c. of the suspected fluid in a Nessler's jar or porcelain dish containing a small amount (about 0.01 gram) of Witte's peptone and add 5 c. c. of reagent "B." In the presence of one part of the aldehyde in two or three million parts of water, a rich violet color appears immediately on mixing the fluids. In the presence of only one part of the aldehyde in five to seven million parts of water a pink or reddish violet color is produced. If formic aldehyde is not present the mixture assumes a yellowish-brown color. The violet color that is produced by formic aldehyde appears immediately on mixing the reagent with the fluid, and any slight reddish-violet coloration that may appear after prolonged standing should be ignored as being due to decomposition products of the proteid.

The rich bluish-violet color which the fluid assumes in this reaction is apparently characteristic of formic aldehyde, and the author has never seen the reaction simulated by any other substance. The presence of large amounts of indol would, of course, slightly simulate that obtained with very dilute solutions of formic aldehyde. But the

presence of one part of the aldehyde in 2,000,000 parts of water will give a color which indol will never simulate.

For the detection of formic aldehyde in milk the test may be applied as above, or instead, 5 c. c. of the milk may be mixed with an equal amount of reagent "A" and poured into a test tube containing a small amount (about 0.01 gram) of Witte's peptone, and the tube then heated in a beaker of boiling water for not longer than five minutes. In the presence of formic aldehyde the fluid assumes a violet color. The test as applied in this way is preferable to the hydrochloric acid and iron test as usually employed, on account of its greater delicacy and the fact that the color change is produced earlier and is more intense. The violet color produced by the "A" reagent is permanent, except when the undistilled milk is used. The change which the color undergoes in this case is due to the large amount of protieds and carbohydrates present.

For the detection of formic aldehyde in solutions containing salts of the heavy metals, as iron, copper, etc., the liquid should be treated as directed for methyl alcohol in similar solutions, the solution being made alkaline with sodium carbonate and filtered through a double filter until perfectly clear, and the filtrate made faintly acid with hydrochloric acid and then tested for formic aldehyde as above. If it be desired to remove the albuminous material from a solution before testing for formic aldehyde, this may be done by adding about 10 per cent of sodium chloride and enough hydrochloric acid to give a distinct acid reaction, bringing the solution to the boiling point, cooling, and filtering. In the presence of considerable organic material other than albumin it will usually be advisable to render the fluid alkaline with sodium carbonate and distill, the test being applied to the distillate. If alcoholic solutions are to be distilled before testing for formic aldehyde, they should be made faintly acid instead of alkaline. The presence of one part of formic aldehyde in more than twenty thousand of urine may be detected by diluting the urine 50 times with water before applying the test. A rich violet color will usually be obtained in this way after the administration of a few doses of urotropin.

For routine use, reagents "A" and "B" may be made extemporaneously by adding one drop of mixed Fehling's solutions to 5 c.c. of c. p. hydrochloric or sulphuric acid, but for the detection of very minute amounts of formic aldehyde, as in the methyl-alcohol tests, the reagents should be made exactly as given in the formulæ. Reagent "A" is mentioned in this paper chiefly on account of the stability of the violet color produced, and also because the intensity of the color is directly proportional to the amount of the formic aldehyde present—other conditions being constant, and the amount of the

aldehyde not exceeding well-defined limits. In carrying out the determination of methyl alcohol in ethyl alcohol the amount of the former present should not much exceed 5 per cent. A solution is made from pure ethyl alcohol containing 5 per cent of methyl alcohol and treated as directed for an aqueous solution containing methyl alcohol, the sodium chloride being omitted and the peptone not added until the test is to be applied for the formic aldehyde. Five c. c. of the fluid are then mixed with an equal amount of reagent "A" and poured into a test tube containing 1 c. c. of a freshly prepared and slightly acid solution of Witte's peptone; the tube is then placed in a beaker of boiling water and allowed to remain for exactly five minutes and is then poured into a Nessler's jar and made up to the mark with water. The alcohol under examination is then treated in the same way; and, if necessary, the original alcohol should be diluted with ethyl alcohol until it is found that the color produced is not more intense than that formed by the standard alcohol.

When this occurs, the standard alcohol may then be diluted with ethyl alcohol until the colors produced by the two tests are the same. From the amount of dilution required can then be determined the amount of methyl alcohol contained in the specimen under examination. Other details can not be given in this place.

Reagent "A" may be substituted for Obermeyer's for the demonstration of indican in urine, for which purpose equal parts of the reagent and urine are mixed in a test tube and gently warmed for a moment or so. The color produced may then be extracted with chloroform as usual. If the heating be continued too long, the indigo blue will be further oxidized to the red pigment. The reagents also constitute a very delicate and reliable method for the detection of albumin or peptone. If a small quantity of the material is placed in a small porcelain dish containing 5 c. c. of a very dilute (one to two or three hundred thousand) solution of formalin and 5 c. c. of the "B" reagent, a rich reddish or bluish violet color will appear in the presence of albumins or peptones. If reagent "A" is employed the test should be made in test tubes, which should be heated by placing in a beaker of boiling water for not longer than five minutes. Since the addition of a trace of formic aldehyde to an acid solution of a cupric salt gives a reaction which so closely resembles that which is obtained by the alkaline solution of a cupric salt with these proteids, it suggests that the reaction in both cases is in some way dependent on the presence of formic aldehyde, and also a probability of an acid and an alkaline phase of the biuret reaction, the difference being that in the alkaline phase the decomposition of the albumin immediately produces a sufficient amount of the formic aldehyde to give the reaction, while in the acid phase the amount of

formic aldehyde produced is so small as to require its further addition in order to bring about a prompt and well-marked reaction. That the cupric salt in this reaction acts merely as an oxidizing agent appears to be proven by the fact that hydrogen peroxide may be substituted for it.

Reagent " B " has been prepared in a way to render it capable of detecting exceedingly minute quantities of formic aldehyde, as is required for the detection of 1 per cent or less of methyl alcohol in ethyl alcohol, and in doing so it was found that it will not respond in the presence of more than 1 part of the formic aldehyde in 1,000 parts of water, but its presence in quantities larger than these will never occur in the oxidization of methyl alcohol by the process used above.

Reagent "A," like Hehner's and the hydrochloric acid and iron test, will not respond in the presence of more than 0.5 per cent of the aldehyde, and solutions suspected to contain this amount or more should be well diluted by the addition of 1 c. c. to a liter of water.

THE CLINICAL ESTIMATION OF THE ALKALINITY OF THE BLOOD.

By Asst. Surg. E. W. Brown, U. S. Navy.

This represents original work carried on in the laboratories of the U. S. Naval Medical School, Washington, D. C.

In the preceding number of the bulletin a brief review of some of the more recent methods for the clinical determination of the alkalinity of the blood was presented, and it was emphasized that in spite of the large amount of literature upon the subject, none of the proposed methods give satisfaction as to simplicity of technique and accuracy. In many procedures in clinical chemistry a rough degree of accuracy only is essential, but in the present subject a good degree of accuracy is necessary, as the alkalinity of the blood in pathological states varies within relatively narrow limits. It is also of no avail to recommend a method which can not be utilized with the facilities of our service hospitals.

The various methods were considered in the previous paper, and, as there stated, the plan proposed by Wright appeared the most practicable. The apparatus is always at hand, the results are quickly obtained, and the experimental error is not magnified by calculation, as in the methods of direct titration. The procedure of Wright although published in England several years ago, does not appear to have gained much currency among American workers and is not referred to in the majority of the present editions of standard works on clinical diagnosis.

The blood is drawn, as in the opsonin work, in the Wright capsules from the ear or finger, the fluid allowed to clot, and after sealing the end of the tube, it is centrifuged and allowed to stand for eighteen hours. A number of the Wright's capillary opsonin pipettes are prepared, and each is marked with a blue pencil for a short distance from the end of the capillary. The other extremity of the tube is provided with a rubber bulb.

A series of increasing dilutions of normal sulphuric acid are prepared, each two successive dilutions differing by fivefold, as $\frac{n}{20}, \frac{n}{25}, \frac{n}{30}, \frac{n}{35}, \frac{n}{40}$, etc. Wright employs litmus paper for the titration, using blue paper which has been steeped in 1–20,000 hydrochloric acid until red, washed to free from acid and dried in a hot-air chamber. This paper should respond to blood serum diluted 20 to 40 times. The method is now performed as follows: The pipette is taken up and by gentle pressure and release on the rubber bulb the serum is drawn up to the blue mark; an air bubble is now allowed to enter and the particular strength of acid is now drawn up to the mark, the two fluids blown out upon a watch glass and thoroughly mixed by respirating. A drop of the mixture is now allowed to fall upon the litmus paper. The procedure is continued until a change of color results between two successive strengths of acid. The method has been criticised on the ground that the change of color of the litmus paper is not satisfactorily sharp; that the drop of serum touching the paper may show a slight change, rapidly fading out, so that a difference of fifteenfold dilution may be necessary before the end reaction is perfectly definite. This was the case in the hands of the writer, and the idea suggested itself to try other indicators which might offer a more delicate reaction with a sharper end point than litmus. I have been unable to locate any such experiments in the literature.

The indicators selected were rosolic acid, lacmoid, congored, azolitmin, alkanin, and dimethyl amido azo-benzene. The indicator solutions were made up according to the general directions given in Cohn's work, but the strengths were considerably modified in most instances to render the test papers sufficiently sensitive. A large number of tests with high dilutions of acids and alkalies were necessary.

Titrations were now carried out, using the various test papers with the same sample of serum. As was anticipated, varying results were obtained with the different indicators. The theoretical questions involved here are of no practical importance in this connection; that indicator which shows the sharpest change of reaction between successive dilutions of acid is to be selected. Lacmoid was found

to be decidedly superior to the other indicators in this respect. In all titrations a difference of fivefold dilution was sharply demonstrated, and, following considerable experience, a difference of a two-and-a-half dilution could be recognized. The most favorable strength of the indicator from which the paper is prepared is a one-third saturated solution. Ordinary filter paper washed in distilled water is dipped in the solution for a fraction of a minute and then dried in a hot-air oven or at room temperature.

The rosolic acid test paper was found to be superior to litmus, but second to lacmoid in sensitiveness. Taking an average sample of serum the order of results on titration would be about as follows: Alkanin $\frac{n}{35}$, rosolic acid $\frac{n}{30}$, litmus $\frac{n}{25}$, lacmoid $\frac{n}{20}$, and dimethyl $\frac{n}{5}$, thus showing the different results on titration with the different indicators. As the method has a strictly empirical value it is thus necessary that the same indicator always be used if the data obtained are to be comparable. In view of the favorable results with lacmoid the method appears to have considerable value.

Chemistry and pharmacy.

By Asst. Surg. E. W. Brown and Pharmacist P. J. Waldner, U. S. Navy.

Edsall, D. L. **The bearing of metabolism studies on clinical medicine.** (The Archives of Internal Medicine, February, 1908.)

Doctor Edsall calls attention to the tendency of clinicians and medical scientists to neglect the practical guiding principles that may be derived from exact investigation. He shows how, when the fundamental principle of the balance of intake and output—that is, the relation of ingested food to excretion—is recognized, that the ideas built up on so many examinations of excretory products in the urine without regard to ingested food can not exist in the light of the studies of metabolism. As an instance, he cites the uric acid diathesis. In the same way the recognition of phosphaturia or oxaluria as a definite diseased condition has gradually been given up. He points out that the studies in metabolism are helping to put dietetics on as rational a basis as therapeutics, for having determined the amount of nutrient material a food contains, we can gauge our doses according to the needs of the individual patient. As to specific diets for different diseases, studies in metabolism have shown they are not justified, for we know almost nothing of any actually specific alterations of general nutrition that may occur in specific diseases, and we know comparatively little of the specific effects of different foodstuffs on normal nutrition.

He emphasizes that metabolism has a new field to work in in the studies of "tissue ferments" and the conception of the protein complex, the meaning of the changes in protein that occur in digestion and metabolism and their bearing on the breakdown and synthesis of tissue. That the action of these tissue ferments depends on the conditions in which they act, whether this action shall be constructive or destructive, affords a wide field of work. That we can control the action of these ferments to some extent already, the management of cases of acidosis seems to show.

The conception of the word "protein complex" is referred to. This indicates that proteins of different species differ, not in the total amount of primary substances, but in the arrangement of these substances, and when digestion of these proteins occurs there is a fragmentation of these complex substances into simpler ones, and these latter are again put together in different amounts, and to some extent different kinds, to reconstruct the variety of protein required by the organism. In the abnormalities of this process of fragmentation and reconstruction we shall find the causes of some nutritional disorders.

The bearing of metabolism studies on clinical medicine is becoming more and more plain, as we discover the underlying principles of these living processes. Their application to diagnosis and treatment, though slight at the present time, will be more and more directly available in practice if the proper principles are followed.—(E. W. B.)

STENGEL, ALFRED. **Chemical and biological methods in diagnosis.** (Trans. Congress Amer. Physicians and Surgeons, 1907, vol. 7, pp. 17–34.)

This article is of more general than specific interest, but some of the matters relating to proteid and uric acid metabolism are of particular importance. Doctor Stengel criticises the routine procedure of determining urea in practically all samples of urine submitted to clinical laboratories. He states that the mere estimation of the amount of urea excreted without reference to nitrogenous intake and the degree of intestinal absorption is valueless; also that even when the diet is fixed and absorption accurately determined, the proportion of urea independent of total nitrogen output is almost equally valueless. He considers that "much supposedly scientific labor is still wasted and erroneous deductions based on this practically useless determination." The relation of purin metabolism and the formation of uric acid to the pathology of gout is discussed. That they are intimately connected is established, but it is fallacious to base any attempted diagnosis of gout on studies of the urine, although it was long considered possible. Stengel's view is that the so-called "uric

acid" diathesis is wholly suppositious. As matters of practical experience we know that the amount of uric acid in the urine is increased in leukæmia, during the resolution of pneumonia, and in certain cases of nephritis. The erroneous impression prevails that there is an increase of urinary uric acid in gout, and in a variety of undiagnosed conditions summarized under the heading of uric acid diathesis, lithæmia, and the like. This mistaken view is founded upon the fact that uric acid calculi are prone to form in such conditions and that deposits of urates or uric acid crystals are likely to occur in the standing urine. Chemical investigation has shown decisively that these results are not due to increased excretion of uric acid, but to conditions in the urine not suited to the solution of uric acid or urates.

It has been very difficult to handle and eliminate this fallacy from practical medicine. It must be insisted that the apparent amount of uric acid, as determined by sediments or crystals seen in the urine, and even accurate estimations are practically of no worth as diagnostic indications. It is true that studies have shown that a decrease of uric acid occurs before acute attacks, some increase during attacks, and practically normal amounts between the paroxysms. The figures, however, are not sufficiently striking to furnish any practical aid in the diagnosis of any stage of the disease.—(E. W. B.)

GOODALL, H. W., and JOSLIN, E. P., **The chemical value of the estimation of ammonia in diabetes.** (Boston Med. Jour., vol. clviii, No. 19, pp. 646–655, 1908.)

The authors emphasize the fact of the large quantity of ammonia in the urine of diabetic patients and that its value in the clinical estimation of the degree of acidosis has not been generally appreciated. This has been due in part to the lack of a reliable clinical procedure for the determination of ammonia in the urine. The recent method of Folin is a great advance in this direction, as it shortens the time required for the test from three days to one to three hours, and has thus made it clinically practicable. Many investigators have shown that little reliance can be placed upon the determination of acetone and diacetic acid as expressions of the total acidosis, and a simple method for the estimation of the chief acid factor, B-oxybutyric acid, still lacks a discoverer. As ammonia registers the efforts which the body is making to protect itself from acid poisoning, it appears that the ammonia excretion is a better index of acidosis. Information as to the nitrogenous character of the diet is of importance in the interpretation of results.

On the basis of an elaborate study of a large and varied number of cases the following conclusions were drawn: (1) Quantities of

ammonia reaching 5 grams in twenty-four hours indicate an extremely severe form of diabetes, which usually proves fatal within a year. (2) Patients under 40 years of age tolerate an acidosis estimated in terms of 4 to 5 grams ammonia far better than those above 50 years of age tolerate an acidosis of 25 to 4 grams ammonia; an acidosis in an individual above 50 years of age is of very serious prognostic import. (3) A knowledge of the ammonia excretion usually helps in the treatment of a case of diabetes, and generally, but not always, gives warning of impending danger. (4) The value of a knowledge of the ammonia excretion in the prognosis of a diabetic patient is enhanced by a knowledge of the quantity of albumin and carbohydrate in the diet. (5) A lowering of the carbohydrate intake in a severe case of diabetes from a total of 80 grams to 55 grams in twenty-four hours produces little effect upon the acidosis.—(E. W. B.)

MacLean, H. **Anomalous reactions given by Fehling's solution in testing urine for sugar.** (The Lancet, March 7, 1908.)

Considerable discussion has followed Doctor MacLean's article on this subject published in the Lancet January 11, 1908, and reviewed in the April issue of the Bulletin. Dr. J. Dixon Mann, in the Lancet of January 18, states that there is a certain amount of evidence in favor of the theory that the yellow precipitate is cuprous hydrate and not cuprous oxide, basing his view on the contention that the utmost comminution will not change the red of cuprous oxide to yellow, and that the cuprous hydrate when exposed to air changes into cuprous hydroxide, with the formation of a blue or greenish-blue color, and as the yellow precipitate obtained in urine testing behaves similarly, it is probably cuprous hydrate. Doctor MacLean takes exception to this view, pointing out that the precipitate obtained after filtration is a mixture of cuprous oxide with some alkali and the yellowish substance; that this mixture turns blue on exposure to air is no proof that the yellow substance is cuprous hydrate, because the red oxide, when mixed with alkali, will also turn blue in a short time under similar conditions. He further asserts that the yellowish substance when carefully freed of alkali will not turn blue on exposure, but the addition of a small amount of alkali induces a more or less bluish discoloration. He maintains that the assumption that the yellow substance is cuprous hydrate suggests the necessity of the formation of the red precipitate, by a process of dehydration, from the yellow substance. Inasmuch as he has shown that a trace of kreatinin will prevent the yellow substance from becoming red, and at the same time prevent an increase in the size of the particles, Doctor MacLean asks if it is likely that a trace of kreatinin can prevent the dehydrating power of a strong alkali.

Reference was made in the review in the April BULLETIN to the parallel case of the oxides of mercury as illustrating a decided difference in color dependent upon a difference in the size of particles. The yellow oxide of mercury is a product of precipitation and is amorphous; whereas the red oxide is a crystalline substance. It may be that the yellowish precipitate obtained in urine testing is an amorphous form of cuprous oxide and that its precipitation in this form is effected by the presence of kreatinin. Pharmacist E. R. Noyes, U. S. Navy, has made some interesting observations at the U. S. Naval Medical School laboratory which seem to indicate that the yellow precipitate is cuprous oxide rather than the hydrate.[a]—(P. J. W.)

SURGERY.

By Surg. H. C. CURL and Passed Asst. Surg. H. W. SMITH, U. S. Navy.

ROBSON, A. W. MAYO. **Pancreatic catarrh and interstitial pancreatitis in their relation to catarrhal jaundice and also to glycosuria.** (Surgery, gynæcology, and obstetrics, January, 1908.)

In the greater number of cases the cause of catarrhal jaundice lies in the pancreas and not in the bile ducts which are simply obstructed. The secretion of bile takes place under very low blood tension, and the excretion of bile along the ducts has very little force behind it, and is therefore arrested by a very slight obstruction.

While it may be difficult to prove the cause of acute catarrhal jaundice from lack of post-mortem evidence, there is not the smallest

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[a] 1. A pure glucose solution added very slowly to boiling Fehling's solution always gives a rich deep red precipitate. When the same glucose solution is added rapidly to boiling Fehling's the color of the precipitate will vary from an orange red to a reddish yellow. If a small quantity of the glucose be added to Fehling's and the mixture brought slowly to the boiling point, the color of the precipitate will be the deep red. If a large quantity of glucose be added to the cold Fehling's and the mixture be gradually brought to the boiling point the color will vary from orange red to reddish yellow.

2. A diabetic urine rich in glucose behaves just the same as the glucose solution, except that instead of a reddish yellow, a canary yellow precipitate may be, and often is, obtained with such urine when the addition is very rapid.

3. A diabetic urine containing 0.75 per cent or less of glucose practically always gives a yellow to orange red precipitate and never the deep rich red Cu_2O.

From results noted under 1, it would appear that it is the state of division rather than the chemical composition which causes the difference in color. It seems unlikely that the same glucose solution would under such slight modification as rapidity of addition involves assume a change in chemical composition. Amorphous or finely crystalline residues result from rapid concentration or cooling, whereas crystals of larger size result from slow concentration. Why would not slow precipitation give a crystalline precipitate when crystallization is possible and an amorphous precipitate result when precipitation is rapid?

difficulty in demonstrating the cause in so-called chronic catarrhal pancreatitis, which Rosenheim believes always dependent on a catarrh of the pancreatic or interstitial pancreatitis. Rosenheim has operated on 20 cases of pancreatitis. In pancreatic disease the greater part of the ingested fats will appear in the feces as unsaponified neutral fats. The symptoms of chronic catarrhal pancreatitis are: Painless jaundice of varying degree associated with digestive disturbance and loss of flesh. If there is intermittent pain it is usually due to some complication such as cholelithiasis or cholangitis, or stones or other calculi; but very fewer intense attacks of colic occur. Tenderness may usually be elicited in the upper abdomen and a transverse swelling may be felt. The urine gives a positive pancreatic reaction. The feces show neutral fat.

In 12 per cent. of cases the pancreas occupied the third portion of the duodenum, and in 40 per cent. the head passed behind the pancreas. In cases of pancreatic swelling, in two-thirds will exist jaundice. In this way is explained also the persistence of jaundice after the passage of gallstones.

Dr. Lloyd Jones is doubtful of the value of the gall bladder in diagnosis, but a clinical history is more satisfactory. Clinical history is not infallible, since the viscus is incapable of fixed diagnosis, because it is not easy, and often impossible, to distinguish between a lesion of the pancreas proper and a lesion of the common duct.

Cantlie's figures as to the frequency of association of common duct with pancreatitis are supported entirely by the anatomical figures given above. Whenever pancreatitis occurs in the common duct, Rosenheim passes a probe into the duodenum and thus palpates the common duct throughout its length. When the duct passes behind the pancreas the latter is seldom affected with inflammatory swelling; but when it passes through the gland and gallstones have been present in the duct the pancreas is practically always affected.

If gallstones exist in the duct for a long time, interstitial changes may develop, and if these changes are prolonged or permanent they may speedily result in interstitial pancreatitis. If interstitial pancreatitis has persisted for a long time, recovery may be impossible.

Glycosuria is not a constant symptom of pancreatic disease. Sugar along with other signs of pancreatic disease, point to a widespread or advanced lesion. In a certain number of cases where interstitial and intralobular changes in the pancreas arise from gallstones or other causes, glycosuria is not found as a symptom. The interacinar variety of pancreatitis will generally develop from the interstitial variety, if the condition be allowed to run on long enough or continued. A small amount of fat in the feces is a contraindication to operation. The advantage of the lateral approach is that it provides permanent drainage for the pancreatic secretion. If the process progresses, no

jaundice ensues. Cholecystenterostomy is the operation of choice in the treatment of interstitial pancreatitis.

Results of operative treatment: Of 102 operations in cases in which pancreatitis was the chief lesion or a serious complication, the mortality was 3.9 per cent, now a little less than 2 per cent. Curative results were obtained in a very large percentage of cases.

MAYO, W. J. **Pancreatitis resulting from gallstone disease.** (N. Y. State Journ. of Medicine, April, 1908.)

Mayo discusses the anatomy and physiology of the pancreas and its associated organs, the forms of pancreatitis and their clinical symptoms. The article follows Robson's work very closely except as to the frequency of the disease, but Mayo believes that he has heretofore overlooked cases in which the pancreas was not unmistakably enlarged by palpation. Mayo confirms in general the value of the Cammidge pancreatic reaction in the urine.

LEPINE, R. **Diagnosis of pancreatic insufficiency.** (Semaine Medicale, Paris, April 1, 1908.)

Lepine concludes that the best methods of determining a disturbance in the external secretion of the pancreas are by the presence of an abundance of fat and a scarcity of saponified matters in the stool, the A. Schmidt method of determining the energy of the trypsin in the digestion of the nuclei of the muscle fiber, and the reduction of the urinary sulphates. The mydriasis induced by adrenalin seems to evidence a lack of the internal secretion of the pancreas.

The gland may be stimulated by certain procedures and the result noted. Volhard's test is based on the fact that the duodenal fluid flows back into the stomach when a large amount of oil or a very acid liquid is ingested. He introduces into the fasting stomach about 200 c. c. of olive oil. Fifteen minutes later he aspirates about 100 c. c. of the stomach contents, and, after pouring off the supernatant oil, examines the fluid for trypsin by the digestion of casein in an alkaline medium. He found trypsin in the stomach nine times out of ten in healthy individuals.

WATSON, CHALMERS. **Clinical value of the pancreatic reaction in the urine.** (British Med. Journ., April 11, 1908.)

General conclusions.—My results confirm the conclusion arrived at by Mayo-Robson and Cammidge, that there is a definite and important relationship between the pancreatic reaction in the urine and

difficulty in demonstrating the cause in so-called chronic catarrhal jaundice, which is, Robson believes, always dependent on a catarrh of the pancreas or on interstitial pancreatitis. Robson has operated on 200 cases of pancreatitis. In pancreatic disease the greater part of the ingested fats will appear in the feces as unsaponified neutral fats. The symptoms of chronic catarrhal jaundice are: Painless jaundice of varying depth, associated with digestive disturbance and loss of flesh. If there is intermittent pain it is usually due to some complication such as cholecystitis, or cholangitis, or stones, or ulcer; dark urine; bulky feces; intense irritation of skin. Tenderness may usually be elicited 2 to 5 cm. above umbilicus and a transverse swelling may be made out. The urine gives a positive pancreatic reaction. The feces show neutral fat.

In 62 per cent of cases the pancreas embraced the third portion of the common duct, and in 38 per cent the duct passed behind the pancreas; hence, in cases of pancreatic swelling, only two-thirds will exhibit jaundice. In this way is explained also the persistence of jaundice after the passage or removal of stones.

Prolonged drainage is necessary from the common duct if the gall bladder is damaged, but a cholecystenterostomy is more satisfactory. Cholecystectomy is not desirable unless the viscus is incapable of functioning; one reason is that subsequent short circuiting is possible should trouble develop later in the pancreas or deeper ducts.

Cammidge's figures as to the frequency of association of common duct cholelithiasis and pancreatitis correspond closely to the anatomical figures given above. Whenever operating on the common duct, Robson passes a probe into the duodenum and thus palpates the common duct throughout its length. When the duct passes behind the pancreas the latter is seldom affected with inflammatory swelling; but when it passes through the gland and gallstones have been present in the duct, the pancreas is practically always affected.

If gallstones obstruct the duct for a long time, interstitial changes may be brought about, and unless drainage be prolonged or permanent, relapse will speedily occur. If interstitial pancreatitis has persisted some time, recovery may be incomplete.

Glycosuria is not a common symptom of pancreatic disease. Sugar along with other signs of pancreatic disease, point to a wide-spread or advanced lesion. In the majority of cases where interstitial (not interacinar) changes in the pancreas arise from gallstones or other causes, glycosuria is not met as a symptom. The interacinar variety of pancreatitis with glycosuria may develop from the interstitial when operation is delayed or drainage not long enough continued. A small amount of sugar is not in itself a contraindication to operation. The advantage of cholecystenterostomy is that it provides permanent drainage, and should inflammatory processes progress, no

jaundice ensues. Cholecystenterostomy is the operation of choice in the treatment of interstitial pancreatitis.

Results of operative treatment: Of 102 operations in cases in which pancreatitis was the chief lesion or a serious complication, the mortality was 3.9 per cent, now a little less than 2 per cent. Curative results were obtained in a very large percentage of cases.

MAYO, W. J. **Pancreatitis resulting from gallstone disease.** (N. Y. State Journ. of Medicine, April, 1908.)

Mayo discusses the anatomy and physiology of the pancreas and its associated organs, the forms of pancreatitis and their clinical symptoms. The article follows Robson's work very closely except as to the frequency of the disease, but Mayo believes that he has heretofore overlooked cases in which the pancreas was not unmistakably enlarged by palpation. Mayo confirms in general the value of the Cammidge pancreatic reaction in the urine.

LEPINE, R. **Diagnosis of pancreatic insufficiency.** (Semaine Medicale, Paris, April 1, 1908.)

Lepine concludes that the best methods of determining a disturbance in the external secretion of the pancreas are by the presence of an abundance of fat and a scarcity of saponified matters in the stool, the A. Schmidt method of determining the energy of the trypsin in the digestion of the nuclei of the muscle fiber, and the reduction of the urinary sulphates. The mydriasis induced by adrenalin seems to evidence a lack of the internal secretion of the pancreas.

The gland may be stimulated by certain procedures and the result noted. Volhard's test is based on the fact that the duodenal fluid flows back into the stomach when a large amount of oil or a very acid liquid is ingested. He introduces into the fasting stomach about 200 c. c. of olive oil. Fifteen minutes later he aspirates about 100 c. c. of the stomach contents, and, after pouring off the supernatant oil, examines the fluid for trypsin by the digestion of casein in an alkaline medium. He found trypsin in the stomach nine times out of ten in healthy individuals.

WATSON, CHALMERS. **Clinical value of the pancreatic reaction in the urine.** (British Med. Journ., April 11, 1908.)

General conclusions.—My results confirm the conclusion arrived at by Mayo-Robson and Cammidge, that there is a definite and important relationship between the pancreatic reaction in the urine and

disease of the pancreas. My results lead me to divide the cases in which the pancreatic reaction was present in my series into the following groups:

1. A group in which there was definite clinical or pathological evidence of serious organic disease of the pancreas.

2. A group in which the reaction in the urine is associated with pronounced arterial sclerosis, a condition usually accompanied by more or less sclerosis in different glands.

3. A group in which the reaction is dependent on congestion and catarrhal condition of the gland ducts and substance, with associated toxæmia, e. g., advanced heart disease, appendicitis, pneumonia, malaria, etc.

OTTENBERG, REUBEN, M. D. **Transfusion and arterial anastomosis.** (Annals of Surgery, April, 1908.)

1. The vessels must be handled with the greatest possible gentleness and must never be grasped with toothed forceps. The best instrument for handling vessels is a fine, bent forceps, known to eye surgeons as "curved foreign-body forceps," or "blood-clot forceps."

2. The part to be cuffed back has to be prepared by carefully cleaning off adherent connective tissue. This is best done by pulling the connective tissue sheath over the cut end and nipping it off with scissors. On the end which is to surround the cuff it is best to leave considerable connective tissue.

3. Throughout the procedure the vessels must be kept moist with normal saline solution.

4. About 1 inch of the vessel to be cuffed and about one-half inch of the vessel to be pulled over the cuff is all that one need expose. The part to be cuffed back is easier to manipulate if free from branches. If branches can not be avoided, they must be tied close to the vessel with fine silk.

5. The ring must be of exactly the right size; that is, its lumen must be just as large as the outer diameter of the vessel to be cuffed back, when full of blood. If one vessel is larger than the other, the ring should be put on the smaller of the two.

6. As in all plastic operations there must be no tension.

7. The part to be operated on must so far as possible be immobilized after operation. For this reason all experimenters on dogs report a far larger proportion of successes with vessels of the neck and interior of the body than with those of the extremities.

8. The best means of temporary blood stasis is the use of Billroth's harelip clamps, well protected with soft rubber tubing.

9. Sometimes the muscular sheath of the vessel contracts so as to render the procedure difficult. When this occurs the muscle may be

made to relax by application of hot saline solution, or the lumen may be gently dilated with a small hemostatic forceps.

10. Absolute asepsis is essential.

MONRO, JOHN C., M. D. **Gumma of the liver as a surgical disease.** (New York State Journal of Medicine, April, 1908.)

Doctor Monro considers that gumma demanding surgical interference are of sufficiently frequent occurrence to warrant its being considered in diagnosing lesions of the liver. Although frequently presenting no symptoms and only discovered at autopsy, when they involve the peritoneum or become necrotic or infected they present symptoms such as pain, tenderness and fever, which often point rather to the diagnosis of gallstones or other diseases of the biliary tract. The diagnosis is made, if it is made before operation, from the history of syphilis, chronic symptoms which often show acute exacerbation pointing to the liver. Diseases of the biliary tract, of the pancreas and malignant growths are to be eliminated. The ascites, so common in malignant disease, is also a symptom of syphilis of the liver of this type. The removal or drainage of the masses, combined with active antisyphilitic treatment, is indicated.

MCGUIRE, S. **Treatment of diffuse suppurative peritonitis.** (Jour. Am. Med. Assn., March 28, 1908.)

The author wishes to have the term "diffuse suppurative peritonitis" used for the class of cases in which pus formation occurs so rapidly that there is no time for nature to wall it off. He calls attention to the very high death rate under the old method of treatment, which was by evisceration, thorough flushing, and multiple drainage. Under more modern methods much better results are secured.

He advocates the "Fowler-Murphy" method, which is carried out as follows:

Open the abdomen over seat of the primary focus and correct the trouble; make a second short incision above pubes and insert a large drain to the bottom of the pelvis; work rapidly and don't stop to sponge away pus; place patient in bed in an exaggerated Fowler position; give saline solution by continuous low-pressure rectal irrigation. Use morphine in small doses for pain and spartein in large doses as a general stimulant and prophylactic against suppression of urine. Wash out stomach if needed and begin feeding with care.

The question of elevating the patient by bed rest or by raising the head of the bed is discussed and the latter recommended. To prevent the patient slipping down in bed, a buttock pad is used, which is held in place by an adjustable rod running to the foot of the bed. The above article has been abstracted with a view to arousing an interest on the part of naval surgeons in this important subject.

ELSBERG, C. A., M. D. **The value of enterostomy and conservative operative methods in the surgical treatment of acute intestinal obstruction.** (Annals of Surgery, May, 1908.)

The author calls attention to the value of time in operative procedures in cases of obstruction because of the poor condition of this class of patients. Most of the indications may be met by operating in two stages, the first to consist simply in establishing drainage. He considers that the danger of leaving a gangrenous loop of gut is slight, and what danger there may be is more than compensated by the time saved and the prevention of absorption of intestinal contents. If gangrenous gut is present it is considered best to bring it out, drain above and below, and delay dealing with it until later. (It seems to the reviewer that the operator would be justified in taking considerable risk in order to remove a portion of gangrenous gut, thereby preventing the great danger of absorption; this would not mean that an anastomosis need be done at the time.) In closing, it is stated that very few fecal fistulæ follow this type of drainage if the "Kader" principle of investing with some of the serous coat is used.

PARKER, E. M., and KERR, H. H. **Intestinal anastomosis without open incision by means of "basting" stitch.** (Johns Hopkins Bulletin No. 206, May, 1908.)

The authors, after reviewing the various operations for intestinal anastomosis, and stating that they have collected accounts of about 200 different methods, propose the following operation: In, for example, the end to end anastomosis, two narrow-bladed serrated clamps are applied, one to each end of the gut to be united; the gut is, after being crushed, cut on the distal side at the clamp edge (this may be done with a cautery). A continuous Cushing suture is now applied, the loop between each stitch crossing from one side, over the clamp blades, to the other side, and continued across the end of the gut; the ends are left long. The other end is similarly dealt with; the clamps are removed and the sutures tightened. The tightening of the suture closes the gut end and at the same time inverts the edges (these are the edges which have been reduced to a dry, flat edge by the clamp). After each side is thus prepared, the ends are held together by an assistant, who holds each end of each "basting" suture. A continuous suture, Lembert, or of whatever sort is preferred, is then placed about these edges, completely closing them in; the basting sutures are cut short at one end and each is removed by a steady pull. The edges are then rolled between the finger and thumb to be sure that the lumen is satisfactory and the operation is finished.

to be decidedly superior to the other indicators in this respect. In all titrations a difference of fivefold dilution was sharply demonstrated, and, following considerable experience, a difference of a two-and-a-half dilution could be recognized. The most favorable strength of the indicator from which the paper is prepared is a one-third saturated solution. Ordinary filter paper washed in distilled water is dipped in the solution for a fraction of a minute and then dried in a hot-air oven or at room temperature.

The rosolic acid test paper was found to be superior to litmus, but second to lacmoid in sensitiveness. Taking an average sample of serum the order of results on titration would be about as follows: Alkanin $\frac{n}{35}$, rosolic acid $\frac{n}{30}$, litmus $\frac{n}{25}$, lacmoid $\frac{n}{20}$, and dimethyl $\frac{n}{5}$, thus showing the different results on titration with the different indicators. As the method has a strictly empirical value it is thus necessary that the same indicator always be used if the data obtained are to be comparable. In view of the favorable results with lacmoid the method appears to have considerable value.

Chemistry and pharmacy.

By Asst. Surg. E. W. Brown and Pharmacist P. J. Waldner, U. S. Navy.

Edsall, D. L. **The bearing of metabolism studies on clinical medicine.** (The Archives of Internal Medicine, February, 1908.)

Doctor Edsall calls attention to the tendency of clinicians and medical scientists to neglect the practical guiding principles that may be derived from exact investigation. He shows how, when the fundamental principle of the balance of intake and output—that is, the relation of ingested food to excretion—is recognized, that the ideas built up on so many examinations of excretory products in the urine without regard to ingested food can not exist in the light of the studies of metabolism. As an instance, he cites the uric acid diathesis. In the same way the recognition of phosphaturia or oxaluria as a definite diseased condition has gradually been given up. He points out that the studies in metabolism are helping to put dietetics on as rational a basis as therapeutics, for having determined the amount of nutrient material a food contains, we can gauge our doses according to the needs of the individual patient. As to specific diets for different diseases, studies in metabolism have shown they are not justified, for we know almost nothing of any actually specific alterations of general nutrition that may occur in specific diseases, and we know comparatively little of the specific effects of different foodstuffs on normal nutrition.

ELSBERG, C. A. **Pneumothorax and posture.** (Medical Record, May 23, 1908.)

In this short article the author gives some interesting results obtained by him in experimental work on animals and in a number of cases in human beings. He considers "posture" as the important factor in preventing the untoward effects so often seen when the pleura is opened while the patient is lying on the back. By placing the patient face downward the pleura can be opened extensively without bad effects. Such posture can be applied even to those patients who are being operated upon while lying on the back; if the condition is unsatisfactory, improvement is secured at once by placing them in the opposite position.

This observation would seem to offer very much better chances to do work involving the pleura and it is hoped that further investigation will confirm the author's conclusions.

LAFFER, WALTER B. **Acute dilatation of the stomach and arterio-mesenteric ileus.** (Annals of Surgery, March and April, 1908.)

Laffer gives a most exhaustive review and analysis of the literature of the disease, embracing the 217 reported cases. A bibliography is attached. His conclusions are:

Acute dilatation of the stomach is very fatal, 63.5 per cent dying. It is not as rare as the literature leads one to believe. This is shown by the rapid increase in the number of cases reported since the subject has become better known.

The pathology and modus operandi of acute dilatation of the stomach and gasto-mesenteric ileus is not definitely known, but the experimental, clinical, and pathological evidence point to a primary innervation disturbance affecting the gastric nerves or their centers in the brain or cord. It has not been proved that the compression of the duodenum by the root of the mesentery is the primary cause of the so-called arterio-mesenteric ileus.

The diagnosis may usually readily be made by having the subject in mind, especially where we have the presence of distention, vomiting of large amounts of greenish fluid, no rise of temperature, rapid pulse, great thirst, little abdominal tenderness, and increasing collapse. The passage of the stomach tube will usually establish the diagnosis.

Treatment should consist of repeated gastric lavage, even when the patient seems moribund. No food or drink should be given by mouth, but saline salt solution transfusion and enemas should be prescribed. Patient should avoid the dorsal decubitus position and assume the knee chest, abdominal, and right lateral positions as much as possible.

CODMAN, E. A. **Chronic obstruction of the duodenum by the root of the mesentery.** (Bost. Med. and Surg. Journal, April 16, 1908.)

In a very suggestive paper, somewhat prospective in character, Codman discusses the rôle played by the root of the mesentery in pro-

ducing duodenal stasis and, secondarily, other very common affections of the upper abdomen. Codman's contentions are:

1. That in the human being the transverse portion of the duodenum is more or less compressed by the root of the mesentery.

2. That slight anatomical deviations from the normal, or certain pathological conditions, may increase this pressure to a varying extent up to the point of complete occlusion of the gut.

3. That when this pressure reaches a degree great enough to give more resistance to the muscular efforts of the duodenum than the closed pylorus, the condition becomes of pathological significance.

4. That thus anatomically the duodenal secretions are brought in contact with mucous membranes unfitted physiologically to withstand their corrosive action.

5. That the obstruction favors stasis in the duodenum, and thus bacterial invasion of the tissues.

6. That if the above propositions can be proved they will materially alter the present conceptions of the etiology and treatment of a variety of pathological conditions, e. g., hyperchlorhydria, nervous dyspepsia, duodenal and gastric ulcers, pancreatitis, cholelithiasis, persistent vomiting after laparotomy and in pregnancy, and excessive fluid drainage from wounds in the common duct and duodenum.

These propositions are discussed in order and an illustrative case cited. The article does not lend itself to abstracting and should be read in the original.

HUNTER, WM. **Delayed chloroform poisoning; its nature and prevention.** (Lancet, April 4, 1908.)

After discussing the disturbances associated with the metabolism of glycogen, fats, and proteids, the author presents the following conclusions:

The vomiting which occurs after the administration of anesthetics is not of nervous origin, but it is * * * essentially toxemic, due to the profound depression of the liver function with consequent diminution in its antitoxic function during the period of the administration. This depression will be the greater if the liver, already weakened by disease or by poor nutrition, be further weakened by food having been withheld for many hours before the administration. This enforced abstention from food before administration of an anesthetic may thus, in individual cases, be carried too far, and it is * * * largely responsible for the fatal effects of delayed chloroform poisoning in exceptional cases. Such effects could in all probability be completely prevented if, instead of withholding food, particular care was taken that the patient had a very nutritious and easily digestible meal, well sweetened, two or three hours before the operation.

Since Guthrie, in 1894, first called attention to the occurrence of "Delayed chloroform poisoning," the condition has been accorded increased importance, and especially of late have very numerous cases been reported. The recognition of this condition has greatly augmented mortality attributed to chloroform anesthesia.

PATHOLOGY AND BACTERIOLOGY.

By Passed Asst. Surgs. C. S. BUTLER and O. J. MINK, U. S. Navy.

MORO, ERNST. **The technique of the tuberculin ointment test for tuberculosis.** (Muenchener Medizinische Wochenschrift, February 4, 1908.)

The ointment is composed of equal parts of old tuberculin and anhydrous lanolin, the latter warmed to 20–30° C. The ointment remains active for a month if kept in the ice chest. One gram is sufficient for 10 tests.

The point of application is just below the ensiform or near the breast. A piece the size of a pea is rubbed over an area of 5 c. m. in diameter for one-half to one minute. The area is left bare for about ten minutes, after which no dressing is required.

Negative results are indicated by the absence of any reaction; positive results by a granular papular efflorescence at the place of application.

There are three grades of positive reaction: (a) Weak: At the place of application within twenty-four to forty-eight hours appear from 2 to 10 single pale or reddened papules, each from 1 to 2 mm. in diameter. These disappear in a few days without itching. (b) Medium strong: There appear within twenty-four hours 100 or more miliary or larger reddened nodes about 3 m. m. in diameter. The skin about these is also reddened. The reaction is limited to the place of application, and there is slight itching. The condition remains unchanged for several days and then fades. (c) Strong: At the place of application there appear within a few hours a hundred or more larger red papules on an inflamed base. The dermatitis is accompanied by itching. Some of the papules reach a diameter of 5 to 8 m. m. and may show exudation, the reaction is not limited to the point of application, but spreads to the neighboring region. After a few days the papules dry and desquamate. After two weeks only a brownish pigmentation remains.—(C. S. B.)

BUTLER, DOCTOR. **Technique of the cutaneous tuberculin test.** (Medical Record, February 1, 1908.)

Make a 25 per cent solution of old tuberculin in salt solution. A similar dilution is used in which one volume of 5 per cent solution of phenol in glycerin is substituted for one of the volumes of salt solution. Separated from each other by a space of 2 inches, on the outside of the arm, which should be prepared as is customary for vaccination, place two drops of vaccine. A small lancet with a dull tip, which is about one-sixteenth of an inch wide and placed vertically in a metal handle, is used to abrade the skin through the vaccine drops

by a rotary motion, only the upper layers of epidermis being removed. The tip is then cleansed and at a point midway between the vaccination marks a third is made without any tuberculin being applied to serve as a control.

If reaction is positive a papule from 5 to 20 m.m. in diameter—at first bright red, later becoming a dark red with an areola around it—will appear at either vaccination point in the first twenty-four hours. Occasionally they are delayed until the second twenty-four hours. Sometimes little vesicles with turbid contents, later becoming confluent, appear over the inoculation site. These fade and disappear after several days, leaving at times a little pigmentation. In positive cases in which revaccination is practiced similar reactions result. In localized tuberculous foci, as in glands and bone, the reaction is especially marked in contrast to the milder reaction seen in persons who have healed foci. At the control point, and at all three points, in case the reaction is negative the slight redness that follows scarification disappears in twenty-four hours without any further changes. There are no constitutional changes as a rule.—(O. J. M.)

Herman, M. Staining of the tubercle bacillus. (Annales de L'Institut Pasteur, January, 1908.)

The author describes a new stain which he has used with sections and smears for the past eighteen years, and which he claims will reveal the tubercle bacillus in material in which otherwise only the inoculation of animals will give positive results.

The stain consists of two solutions: (1) Ammonium carbonate in distilled water, 1 per cent; (2) crystal violet (methyl violet 6B) in 95 per cent ethyl alcohol, 3 per cent. The two solutions are kept in separate bottles and, for staining, one part of (2) is mixed with three parts of (1). The sections are placed on a cover glass, the water evaporated, and about seven drops of the staining mixture are placed on the specimen and allowed to steam for one minute over a water bath. (At the Naval Medical School equally good preparations were obtained by steaming over the direct flame, avoiding, if possible, ignition of the staining mixture.) Place for a few seconds in 10 per cent nitric acid and then in 95 per cent alcohol to decolorize. Mount without a counterstain or use eosin 1 per cent or a very dilute fuchsin. The organisms are purple. This method has been tried at the school and has been very satisfactory. It possesses two distinct advantages other than those mentioned by the author: (1) It can be readily washed from bottles and all forms of glassware, thus making a much cleaner stain than carbol-fuchsin: (2) in decolorizing, the violet stain washes out of substances other than the tubercle and like

bacilli almost instantly, while with the carbol-fuchsin stain the red color is held very tenaciously by the mucus in the sputum, especially if the smears are rather thick.

Crystal violet is not an expensive stain, the price being practically the same as the price of fuchsin.—(C. S. B.) (O. J. M.)

SMITH, THEOBALD. **Some neglected facts in the biology of the tetanus bacillus.** (Jour. Am. Med. Assn., March 21, 1908.)

In 1898 Smith called attention to the inefficiency of discontinuous sterilization when large quantities of bouillon were boiled. In the preparation of diphtheria toxine, when the diphtheria bacillus, by its surface growth, had established anærobic conditions, if spores had escaped being killed, they would germinate. Some of the anærobic organisms gotten in this way killed guinea pigs overnight. Upon further examination of one of these cultures, using minute doses for injection, it was found that all the animals inoculated became infected with tetanus. The culture proved to contain two spore-bearing organisms, one of which was the tetanus bacillus, which had withstood three steamings of twenty minutes each.

Kitasato's statement that the spores of tetanus resist heat at 80° C. for one hour and are killed by streaming steam in five minutes was accepted and noted in the text-books up to 1903. Owing to some unfortunate results (development of tetanus) after the injection of gelatin for hæmostasis, Levy and Bruns in 1902 determined anew the resistance of tetanus spores. According to these authors destruction begins in eight and a half minutes at 100° C.; after fifteen minutes very few survive; after thirty minutes, none.

Turck, after some experimental work, is convinced that "no spores of tetanus can resist boiling for over twenty minutes." Falcioni, after impregnating gelatin with the spores of tetanus, found that they resist destruction for two and a half, but not for three hours in streaming steam. These results suggested to the author that strains of tetanus bacilli exist, the spores of which vary widely in their resistance to moist heat at 100° C. Before resting on this point, however, it would be necessary to know the tendency to spore formation in different media and at different temperatures, the age of the culture at which spores are ripe and therefore most resistant, and the reaction of the medium in which the spores are boiled or steamed, because all of these variable factors have probably entered into the experiments quoted.

The author's method to produce a rich crop of spores was as follows: To ordinary bouillon in suitably constructed fermentation tubes is added a bit of kidney, spleen, or liver from a rabbit or guinea

pig just killed with chloroform. The piece of tissue is torn or pinched away from the organ with fine sterile forceps and varies from one-half to three-fourths of a centimeter in bulk. This is placed in the connecting tube where it remains. The tubes should be incubated for several days to see that they are sterile before using for anaërobic cultivation. Ordinary bouillon is used in these tubes, no sugar being added. Only healthy animals should be used in obtaining the tissue for these tubes. When tubes prepared in this way are inoculated with material containing spores or bacilli a rapid and abundant multiplication takes place. Spore production is especially rich in and about the piece of tissue. Fluid from such cultures was used to determine the resistance of the spores at the temperature of boiling water or streaming steam. The author describes a number of experiments carried out with different strains of the tetanus bacillus. From these experiments the author concludes that some tetanus spores regularly survive a single boiling or steaming for twenty minutes, usually for forty minutes, and occasionally for sixty minutes. In one case seventy minutes' exposure did not destroy all the spores. The experiments are sufficient to prove the possibility of tetanus spores appearing in culture fluids sterilized by discontinuous boiling or steaming in routine laboratory work, even when a relatively small amount of fluid is exposed to streaming steam for fully twenty minutes on three successive days.—(C. S. B.)

VAN LOGHEM, M. D., J. J., Amsterdam. **Some notes on the morphology of the spirochæta duttoni in the organs of rats.** (Annals of Tropical Medicine and Parasitology, February 29, 1908.)

The tissue was stained by Levaditi's method, embedded in paraffin, and sections from 4 to 6 microns were cut.

At the height of the infection the large and small vessels were crowded with spirochætes. The parasites were best outlined in the capillaries of the lung and liver, while in the heart and great vessels they were massed in broad strands. In the spleen they were few in number and mostly intracellular.

The parasites vary in shape, being most characteristic in the heart and lung. In the liver and spleen were found small circular or oval tightly coiled spirals about half the size of a red cell, recognized only by the staining reaction and the presence of intermediate stages. Similar forms have been obtained in smears from the liver and spleen, which with Giemsa's stain are red surrounded by a well-stained membrane. These forms have been explained in two ways: (1) As "agony forms" preceding further stages of degeneration and disintegration; (2) as a "resting stage" in the life cycle of the parasite.—(O. J. M.)

SHENNAN, M. D., F. S. C. S. (ED.), THEODORE. **The localization of the spirochætes in the papules of yaws.** (Journal of Pathology and Bacteriology, January, 1908.)

Several distinct appearances are described in epithelial layer of a yaws papule stained by Laviditi's method, viz: (a) The layers near the corium are normal; (b) numerous pale areas of swollen, vacuolated, and degenerated cells; (c) a superficial granular cellular layer, the more superficial parts deeply impregnated with silver; (d) small circumscribed almost colorless areas, which show leucocytes when stained by the ordinary methods.

Spirochætes are found with few exceptions in the epithelial layer and are most common in the pale degenerating portions of the epithelium (b). Here they are often present in great numbers and may form closely matted clumps.

In the deeper epithelium the organisms are common. When a papillary process touches a pale, degenerating area (b) numerous spirochætes are found in the tip of the process, but they are rarely found in other parts of the processes and never in the true corium.

The appearances thus differ from those presented in syphilis, in which the spirochætes are found constantly in the true corium and passing upward into the deeper layers of the epithelium.—(O. J. M.)

MEDICAL ZOOLOGY.

By Surg. R. C. HOLCOMB, U. S. Navy.

MACDONALD, T. F. **Experiences of ankylostomiasis in Australia.** (Journal of Tropical Medicine and Hygiene, January 15, 1908, p. 25.)

In this article the author deals with the subject of ankylostomiasis as he encountered it in the subtropical regions of Australia, particularly about Cairns, Townsville, and Brisbane. He states that in one school he found 90 per cent of the pupils infected.

Among the symptoms which he mentions, particularly among the children, is that of dirt eating. Adults, on the other hand, he found developed an abnormal delight for pickles, curries, and alcohol. He also mentions what he terms psycho-pathological symptoms, characterized by a train of moral lapses, with tendencies toward degenerate habits—such as disobedience, cunning, lying, stealing, and precocious sexual habits. The author believes that Australia acquired the infection of ankylostomes through three distinct channels, namely: First, the South Sea islanders; second, Arabians; and third, Italians.

It appears from the author's statement during the discussion of his paper at a meeting of the Society of Tropical Medicine and Hygiene, that the organisms found in Australia are the *Ankylostomum duodenale*, the *Necator americanus*, and possibly a third undescribed species.

GUTIERREZ-IGARAVIDEZ, P., GONZALES MARTINEZ, I., AND SEIN Y SEIN, Doctors. **Report of the commission for the suppression of uncinariasis in Porto Rico. 1907.**

This report comprises a volume of 55 pages in English, 120 pages of Spanish text, and an appendix of statistics, consisting of 117 pages in Spanish and English.

During the year, 89,233 patients suffering with this disease were treated, with a total of 425,131 visits. The bulk of the patients treated were between the ages of 15 and 20. More than two-thirds of all cases treated were between the ages of 15 and 49. The largest percentage of cures was between the ages of 15 and 29—31.61 per cent, and more than 60 per cent of all deaths took place between the ages of 15 and 49. The commission, as result of their long experience with uncinariasis as it occurs in Porto Rico, states that the uncinarial dermatitis is the first sign of the infection. This is a papulo-pustular dermatitis which is known to the peasants as *mazamorra.* The same patient may suffer repeated attacks of *mazamorra* as a result of repeated infection.

The parasite is not a blood sucker, in the opinion of the commission, in the sense that it is his normal food. Nor do they believe that other than a very small amount of blood would be lost as a result of the bite of so small a parasite. In their necropsies of the past year they have only once encountered the rose-red ecchymoses described in the older works as occurring in the jejunum. Of about 80,000 uncinariæ examined by them, an immense majority of the worms had no trace of blood in their body cavities, and were grayish-white in color. The main symptoms of the disease are, in their opinion, a result of the absorption of toxins generated by the parasite.

Of the early symptoms, particularly among persons of means, they mention dyspepsia. This dyspepsia, with frequent headaches and dizziness, they attribute to the absorption of toxins secreted by the parasite. With regard to the presence of albumin in the urine, the commission state that this is a very common condition and is usually accompanied by hyaline, finely granular, or fatty casts, rarely epithelial or blood casts, and that these findings must be regarded as evidence of a degenerative process in the kidney, a result of the disease. They believe uræmia to be more common in Porto Rico than the reports would tend to show. So far as the drugs thymol and betanaphthol are concerned, they can both act as renal irritants in this condition, but the safer of the two in the long run they regard to be thymol. They believe that renal accidents as a result of these anthelmintics are not generally of a serious nature and still more rarely fatal.

With regard to morbid anatomy, their observations are interesting and instructive. As a rule the body showed no emaciation, and the amount of the adipose tissue was generally normal. There was not

only œdema, but a change of color in the skin, muscles, and internal organs, the result of the intense anæmia. Usually the peritoneal cavity contained some fluid; also the pleura, pericardium, and sometimes the cerebral ventricles. The heart was frequently hypertrophied. The lungs were frequently the seat of œdema and passive congestion. The liver was practically never normal. It was never diminished in size, and fatty degeneration of more or less extent was present in all cases. The kidneys were also involved. They were pale in color and apt to be slightly enlarged. Usually there was little or no connective tissue increase, and while changes were always found in the tubules and glomeruli, the convoluted tubules suffered most severely. Hemorrhages into Bowman's capsule were found in four cases, and these four had all received the beta-naphthol treatment. Among the finding in the stomach a gastric catarrh was common, often with some degree of dilatation. Although it was rare to encounter uncinariæ in the stomach, 83 were found in its lumen in one instance. In the intestine the most of the uncinariæ found at autopsy were in the jejunum; in the first part of the duodenum were found most of the rest. There were very few in the ileum, and none were encountered in the colon. These parasites were often found alive twelve or fifteen hours after death of their host. They were rarely red and generally of a grayish white. The lesion of the intestine, which it appears was confined to the mucosa, was by no means deep, and consisted of a tiny superficial erosion about $\frac{1}{50}$ of an inch in diameter. Some of the erosions it was difficult to find without a hand lens. The duodenum and jejunum were the seats of chronic intestinal catarrh, although the rest of the intestine and even the colon were apt to share, though to a less degree, in this inflamed condition. The spleen was usually small, with a great paucity of lymphoid elements: the malpighian corpuscles, and even the protoplasm of the cells, it appears, were reduced in size. The hemolymph glands about the aorta were found markedly increased in size in one case. The marrow of the mid point of the femur was examined in two cases and in both found to be of grayish red color and very soft.

With regard to the treatment, the commission still give the preference to thymol. The eucalyptus oil, chloroform and castor oil mixture they tried on a few cases, but in their hands it was inferior to beta-naphthol or thymol. The commission, after a long experience with a large number of cases of this disease, are of the opinion that ferruginous medication is useless for the cure of anæmia due to uncinariasis.

The report of the substation at Vieques, by Doctor Guillermo Camera, has an interesting note with regard to the presence of intestinal bilharziosis in that island. Of a total of 801 cases under treatment there 13.71 per cent are stated to have the intestinal form of bilharziosis, some entire families of 10 or 12 members being infected with this parasite.

WHERRY, W. B., WALKER, AGNES, and HOWELL, E. H. **Plague among rats in San Francisco.** (Jour. Am. Med. Ass'n, April 11, 1908, p. 1165.)

Under the above title these authors submit the results of their studies of epizoötic plague in rats. Their data is based on the microscopic and anatomic appearances of 14,184 rodents examined between September, 1907, and January, 1908.

They agree with the last Indian plague commission in their belief that the naked-eye method will alone furnish sufficient evidence on the question of a rat being infected with plague or not.

Of the 14,184 rodents examined the species and the number found infected were distributed as follows:

Species.	Total number examined.	Species.	Total infected.	Per cent infected.
		Per cent.		
Mus decumanus	13,934	98.79	139	0.99
M. rattus	105	.73	1	.95
M. r. alexandrinus	51	.33	2	3.84
M. musculus	16	.11	.....	.....

It is thus evident that the most common rat in San Francisco, as well as the greater number found infected, were of the species *Mus decumanus*.

In the post-mortem examination no single abnormality invariably occurred. The more characteristic findings are thus tabulated:

	Times present.
Subcutaneous injection	52
Enlarged congested glands	74
Enlarged congested spleen	60
Hydro or hemo thorax	63
Liver mottled with focal necrosis	13

The method adopted by them was to make a smear from the spleen of each rat and examine microscopically. Whenever suspicious bipolar staining bacilli were found their pathogenicity was tested by scarifying the abdomen of a guinea pig, rabbit, or white rat and infecting it with a bit of the diseased tissue. In addition, + 1 agar slants were used for cultures of spleen and heart blood.

They found the bacillus of natural rat plague in San Francisco quite as virulent as the strains tested in Bombay.

	Time preceding death in days.	Average time preceding death in days.
74 guinea pigs vaccinated	2-8	4.9
19 guinea pigs inoculated subcutaneously	1-8	3.4
10 rabbits vaccinated	2-8	4.7
12 white rats	3-5	3.5
3 white rats inoculated subcutaneously	3-6	4

NOTE BY REVIEWER.

The *Mus decumanus*, Norway rat or brown rat, is by far the most frequently encountered species. This rat represents one of the most remarkable instances of successful usurpation to be found in the animal kingdom. It is exceedingly ferocious and is said to have driven the black rat, or *Mus rattus*, from most parts of England and a large area of the continent of Europe. It first appeared in Russia about 1727, when in large numbers it crossed the Volga from central Asia and made its way westward. It invaded England about 1730 and appeared in Paris about the middle of the eighteenth century. It was introduced into America about 1775, where, as elsewhere, it has practically expelled the black rat. These rats often reach a great size and are characterized by their heavy build, massive, blunt muzzle, comparatively short ears, relatively short tail (it being shorter than the length of its head and body), and its coat of coarse, grayish-brown hair. It is an exceedingly ferocious and powerful animal. It is practically omniverous in its diet.

The prolific nature of the brown rat would thoroughly account for its enormous numbers when in favorable situations. Several litters of from 8 to 14 are produced annually, and the female is said to breed when only half grown.

The *Mus rattus*, or black rat, is smaller and more elegantly built than its cousin, the brown rat. Its average length it about 7 inches, or 2 inches shorter than the brown rat. Its tail, however, is relatively longer, being 8 to 9 inches in length. Its snout is long and slender, projecting beyond the lower jaw. Its ears are relatively larger than in the case of the brown rat. This rat, like the brown rat, was probably introduced into Europe from the East. It is known to have been present there in the thirteenth century. The black rat is said to be the ship rat par excellence. Most of the black rats caught in San Francisco were from ships or wharves; few were caught more than a mile from the docks.

Mus rattus alexandrinus, or Alexandrine variety of the black rat, or Egyptian roof rat, is almost as cosmopolitan as its two cousins just described. It is found in North America, North Africa, India, and Australia. In general appearance it resembles the black rat, except that the whole under surface is a pure white, with sharply demarcated borders.

Mus musculus. This is the common house mouse, which, although originally a native of Asia, is now of almost world-wide distribution. The characteristic features of this species are its relatively large ears, long tail, and nearly uniform brownish coloration. It has a partiality for human habitations and their neighborhood, its tastes being practically omniverous. This mouse is nearly as prolific as

the brown rat, producing from three to five litters in a year, each of which includes from 4 to 8 blind young. In domestication white and pied breeds of this mouse are common.

GARRISON, PHILIP E., Assistant Surgeon, U. S. Navy, Biological Laboratory, Bureau of Science, Manila, P. I. **A preliminary report upon the specific identity of the cestode parasites of man in the Philippine Islands, with a description of a new species of Tænia.** (The Philippine Journal of Science, vol. 2, No. 6, section B, Medical Sciences, p. 537, December, 1907.)

The purpose of this paper is to present in a systematic way some definite knowledge with regard to the specific identity of the more common animal parasites of man in the Philippine Islands, with a view to clearing the field for future work in the localities in question.

The material comprises such specimens as have been gathered for the helminthological collection of the Philippine bureau of science, and was obtained largely from the native prisoners of Bilibid Prison.

Tænia saginata Goeze, 1782. Twenty-six of 31 specimens of *Tænia* are of this species; 22 were from native Filipinos.

Tænia solium Linnæus, 1758. Two specimens of the pork tapeworm were obtained from native prisoners in Bilibid.

Tænia philippina. The establishment of this species rests upon a single specimen obtained in 1905 from a native prisoner in Bilibid. In discussing this type specimen, Garrison says:

> While the examination of further material may lead to changes in the diagnosis of the species, either by the elimination of some characters now included or by the addition of new ones, it is believed that the principal morphological features described, namely, the transversely elongated ovarian lobes and vitellogen gland, the V and spiral formation of the uterine stem, the compact structure of the gravid uterus, the loop of the vas deferens, the length of the strobila, and the relative length and breadth of the individual segments, form a combination of characters which could neither be accounted for by peculiarities in the living individual nor by its post-mortem distortion.

Hymenolepis nana (Siebold, 1852) Blanchard, 1891. Five infections of this parasite are mentioned—four in native prisoners, at Bilibid Prison, all adults, and one in a native child at Cavite under the care of Surg. D. N. Carpenter, U. S. Navy.

Hymenolepis diminuta (Rudolphi, 1819) Blanchard, 1891. One case, a Chinese prisoner at Bilibid Prison, was found infected with this parasite. The prisoner was discharged the day the specimens were passed, so no history was secured.

Dibothriocephalus. A worm resembling the *D. latus* was found in the intestine of a domestic cat, but no infections of a parasite of this genus was found in man.

Diplogonoporus grandis (Blanchard, 1894) Luche, 1899. This parasite had not been observed.

Echinococcus. While two cases of human infection of echinococcus were reported by Strong, no specimens are preserved in the helminthological collection of the Philippine bureau of science.

TROPICAL MEDICINE.

By Surg. E. R. STITT, U. S. Navy.

ASHBURN, P. M., Captain, and CRAIG, C. F., First Lieutenant, U. S. Army Medical Corps. **A comparative study of tsutsugamushi disease and spotted or tick fever of Montana.** (Philippine Journal of Science, January, 1908.)

In connection with views entertained by Doctor Miyajima of the Institute for Researches of Infectious Diseases, that Japanese river fever, or tsutsugamushi, might be identical with Rocky Mountain spotted fever, this Japanese disease was investigated by Doctors Ashburn and Craig of the Medical Corps of the U. S. Army, with a view to determining the question. Ashburn had studied spotted fever in the Bitter Root Valley, in Montana, during 1904 and 1905.

Comparing the etiology of the two diseases, the authors state in connection with tsutsugamushi that it occurs only in certain regions of Nippon, where the banks of certain rivers are submerged during June. The infective regions are not dangerous until about a month after the subsidence of the water, and simultaneously with the appearance of the akamushi, or red mite. Many who are bitten do not contract the disease. Ogata thinks that these mites transmit a plasmodium; others consider the infecting agent a bacterium.

As regards spotted fever of Montana, they state that it occurs in strictly limited areas, especially on the west side of the Bitter Root River. The snow of the mountains, which begins to melt in March, causes the river to rise, and low water is not reached until in July. At this time ticks (*Dermacentor andersoni*) appear in great numbers, and in those infected there is almost always a history of tick bite. Ricketts and King have demonstrated this method of infection.

It will be noted from the above that tsutsugamushi is conveyed by the bite of a larval Trombidium, while spotted fever is transmitted by an adult tick.

As regards the symptomatology of the two diseases, they state that the constant signal symptoms in tsutsugamushi of lymphadenitis, which can be attributed to a small circular area of necrosis in the skin following the bite of the mite and which subsequently becomes a punched-out ulcer, is not present in spotted fever.

The eruption of tsutsugamushi, which appears about the seventh day, first shows on the face and then extends to the chest and extremities. In spotted fever it appears earlier, and first shows itself on the wrists and ankles. Furthermore, the eruption of spotted fever becomes petechial, a fact not noted in the Japanese disease.

The fever is not essentially distinct, neither are the eye symptoms or the splenic enlargement.

The differential blood counts made by Ashburn and Craig did not seem to show anything unusual—on the average about 12 per cent of small lymphocytes, 12 per cent of large lymphocytes, 5 per cent of large mononuclears and transitionals, and about 70 per cent of polymorphonuclears. They judged that a leucopenia existed.

In connection with Sambon's view as to the identity of typhus and spotted fever, it is interesting to note that the authors consider that it would be difficult to differentiate typhus from tsutsugamushi or spotted fever, except by seasonal and geographical distribution and by lack of contagiousness. Sambon claims that where vermin are excluded from hospitals typhus does not show contagiousness.

The points of differentiation between tsutsugamushi and spotted fever are admirably presented in parallel tables.

In the final pages of the article, the history of several cases of a peculiar disease occurring at Camp Connell, Samar, is given. In these cases there was an eruption, glandular enlargement, leucopenia, and considerable involvement of the sensorium. It is suggested by the authors that this disease may be the same as tsutsugamushi.

CRAIG, C. F., First Lieutenant, U. S. Army Medical Corps. **Studies upon the amebæ in the intestine of man.** (Journal of Infectious Diseases, June 4, 1908.)

Craig claims that it is not possible to compare organisms obtained from cultures of amebæ with those observed in feces. He considers that the evidence at hand is sufficient to establish the truth of Schaudinn's differentation of amebæ in human feces into *Entamœba coli* and *Entamœba histolytica*. He states that an important point that has been overlooked is the impossibility of cultivating *E. coli; E. histolytica*, and amebæ from extraneous sources having been so cultivated.

Referring to personal observations, he states that in 1905 he examined the feces of a large number of soldiers and found *E. coli* in 65 per cent. These men were in robust health and gave no history of diarrhea or dysentery. An examination of the feces of several officers at the same time showed amebæ of the same type, but at the date of writing (1908) none have developed dysentery.

Referring to the work of Ashburn and himself, he states that from an examination of 107 healthy men at Manila 76 were shown to be infected with *E. coli* and only 2 with *E. histolytica*, and of these men only the 2 showing *E. histolytica* developed dysentery.

Discussing the confusion of the pathogenic and nonpathogenic amebæ by observers, he states that he is convinced that a considerable proportion of the cases returned from the Philippine Islands during 1900 and 1901 diagnosed as amebic dysentery were in reality cases of enteritis showing *E. coli* in the feces.

As regards methods of examination, he refers to the advantage of using a very dilute solution of neutral red in fresh specimens and of staining dry spreads by Wright's stain.

In connection with differentiation, he states that while as a rule *E. coli* is smaller on the average, yet size can not be depended on for such differentiation. He considers that color is an important point, noting that even when blood is added to feces that *E. coli* retains its grayish color and does not become greenish, as is the case with *E. histolytica.* He considers the *E. histolytica* as normally phagocytic for red cells. He refers to the fact pointed out by Schaudinn of the difficulty of distinguishing the ectoplasm and endoplasm of *E. coli*, even when there was motion. He also refers to the well-defined central nucleus of the *E. coli.*

As regards staining with Wright's stain, he states that *E. coli* shows three distinct portions—ectoplasm, endoplasm, and nucleus. The ectoplasm stains a very light blue, while the endoplasm stains an intense blue and consist of granules. The nucleus is a bright red. In *E. histolytica* the ectoplasm stains intensely, while the endoplasm stains dimly. The nucleus being poor in chromatin also stains a very delicate pink. He refers to the article of Walker in the Journal of Medical Research, 1908, as being based entirely upon amebæ studied from cultures and not from feces in a single instance, and considering the grave structural changes occurring during cultivation, he does not attach much importance to Walker's conclusions.

CELLI, PROFESSOR. **The campaign against malaria in Italy.** (Report to the Fourteenth International Congress of Hygiene in Berlin.)

In treating of the subject of quinine prophylaxis of malaria, Professor Celli recommends that quinine be given daily because it is better borne and even increases appetite and digestion. He considers that if taken daily it is always present in the blood and prevents the symptoms of cinchonism. He disapproves of the methods of administration of Zieman (every four days), of Plehn (every five days), and of Koch (every seven to ten days). He believes that the daily use of quinine prevents perniciousness, and makes malarial infection milder and more amenable to treatment.

He gives about 6 grains of quinine each day as a prophylactic, and states that such a dose can be continued without any bad effects for several months.

STITT, E. R., Surgeon, U. S. Navy. **Are there valid objections to the quinine prophylaxis of malaria?** (Jour. Am. Med. Assoc., May 23, 1908.)

In this article the history of a battalion of marines is given where 398 marines, of whom 75 per cent were recruits, left Philadelphia May 21, 1906, reaching Colon seven days later. This force was in camp on the Isthmus about one month, during which time 10 grains of quinine was given to each man daily as a prophylactic against malaria. Upon leaving Colon early in July 118 cases of malaria developed during the first three days at sea. At this time prophylactic doses of quinine were again given to those not already cinchonized.

During the passage to Boston there were 215 acute malarial paroxysms recorded, and it was noted that the cases did not respond at all satisfactorily to quinine given in curative doses, frequently hypodermatically.

The question is brought forward as to the possibility of malarial parasites acquiring an immunity to quinine.

WALDOW, Doctor, Regierungsarzt und Marinestabsarzt, Kamerun. **Porocephalus moniliformis Diesing, 1836, in a negro (Kamerun).** (Arch. f. Schiffs- und Tropen-Hygiene, Bd. xii, Heft 10, 1908, p. 321.)

Waldow, while making a post-mortem of a young negro, aged 25 years, having died under fever and hallucinations and illusions of sight and hearing, discovered in the serous covering of the liver small, whitish tubercles containing encysted larvæ of *Porocephalus moniliformis*, Diesing, 1836. Encysted larvæ of the same parasite were found in several places of the mesentery. On cutting open the intestine two living adults were seen, one in the gut, the other attached to the serous layer of it.

The cerebral hemispheres were covered inside the dura mater by a thin, loosely adhering, bloody skin, extending also to the base of the cerebrum. The pia mater was slightly cloudy, its vessels filled with blood; the sinuses were filled with coagulated blood, as were also the right heart and large veins. His diagnosis was: Porocephaliasis and Pachymeningitis hæmorrhagica interna. In his epicritical remarks the author states that the cause of the mental disturbance is to be found in the exudate on the inside of the dura mater. In the absence of other morbific causes, the worms and their excretions must be looked upon as being the etiological factors of the disease. Waldow believes that the infection was brought about through the stomach and that from here some of the larvæ passed into the liver, others into the intestine, and thence into the free abdominal cavity. Besides in man, the larvæ have been found in the giraffe, a hyena *cynocephalus mormon*, the mandrill, and *sercopithecus albogularis;* never before has the adult parasite been found in man.—(*Medical Inspector H. G. Beyer.*)

ABE, Doctor Med. Nakao. **On the etiology of dysentery.** (Arch. f. Hygiene, Bd. 65, Heft 2, 1908, p. 107.)[a]

In a very careful study of a number of cases of dysentery during an epidemic of that disease occurring at Satsuma, Doctor Nakao Abe was unable to discover either an amœba or the classical Shigo bacillus. He discovered, instead, in the stools of his patients, in almost pure culture, a bacillus very closely related to bacillus coli communis. The serum from his patients possessed high agglutinating powers for this bacillus.

Doctor Abe believes that the causes of dysentery, like those of pneumonia, are multiple, and that the name of dysentery is not an etiological but rather a collective term for a disease which, etiologically, consists of different forms.—(*Medical Inspector H. G. Beyer.*)

BENSEN, Dr. W., Marinestabsarzt. **Poisoning by the juice of the manzanilla tree.** (Archiv f. Schiffs- und Tropen-Hygiene, Bd. xii, Heft 10, Mol 1908.)

Bensen reports several examples of poisoning by the juice of the manzanilla tree (*Hippomane manzanilla* L.) belonging to the family of Euphorbiacæ, of which the following case, observed by him while attached to H. M. S. *Panther*, cruising in the West Indies, in 1903–4, and while temporarily at St. George, Grenada, is of interest:

Machinist mate L., while ashore on the afternon of September 17, 1904, ate a manzanilla fruit, and went in bathing shortly afterwards. While in the water had a burning sensation in the throat, which was not relieved by gargling with fresh water. He went to town and took several drinks of soda and whisky. Several painless liquid stools followed. When he reported on board, three hours after taking the fruit, he had great pains in lips, mouth, throat, and bowels, and about the rectum, with a feeling of general weakness. He looked pale, had an unsteady gait, pulse weak—70 per minute—skin cold and covered with cold perspiration. Hearing and sight were normal. The buccal cavity, near the uvula, soft palate, tonsils, and back part of the tongue was covered with flat, small blisters, and the whole cavity showed intense reddening. Palpation of the abdomen elicited pain and audible gurgling. The neighborhood of the rectum was abnormally red. Passed neither stools nor urine. Patient received some castor oil and then 10 tablespoonfuls of magnes. usta. After that some whisky was administered and an alum gargle prescribed. Great relief was experienced after taking the magnesia. The next morning the patient felt very weak, the mucus membrane of the mouth had come off, leaving large, red surfaces; there was a burning sensation in bladder and urethra; the small

[a] From Hyg. Institute Univ. Kyoto, Japan.

amount of urine that was passed was turbid, containing a good deal of mucus but no albumin. Pulse was stronger, and, on a milk diet, the patient rapidly improved. At the end of four days the stools became firm, urine clear, and the mucus lining of the mouth assumed normal appearance. At the end of six days patient was discharged, able to do duty.

The juice from the manzanilla tree, it would seem from this case, is more of a caustic than of a poisonous nature.—(*Medical Inspector H. G. Beyer.*)

GENERAL MEDICINE.

By Surgs. R. M. Kennedy and F. L. Pleadwell, U. S. Navy.

Wilkinson, W. W. **Review of internal medicine.** (Washington Medical Annual, January, 1908, pp. 438-439.)

As careful a digest of the periodic literature as possible has been made. In so extensive a subject and considering the vast number of contributions made to the profession, it will only be possible to refer to those things given the most prominence and the acceptance of which seems warranted by apparently convincing clinical and experimental data.

Deserving first consideration seems the present status of diet, nutrition, and allied with them the physiology of digestion.

Proteid has naturally received the greatest attention: First, by a study of the processes and products of digestion; and, second, by a more intimate knowledge of the chemical composition of the proteid molecule. This is now known to consist of numerous crystalline bodies, the aminoacids, and of these, mainly or only, each kind of proteid possessing a numerical and graphic structure peculiar to itself. While complex in themselves, these are regarded as the end products of proteid fragmentation, and not albumose and peptone, as formerly taught. Both pepsin and trypsin have been shown to carry proteid beyond the peptone stage. It has been shown by Cohnheim that the intestinal mucous membrane produces a proteolytic ferment—erepsin. As a result of the study of the action of these ferments on proteid, two facts are given us; first, that proteid is fragmented beyond the peptone and albumose stage; and, second, that the reconstruction of these foreign aminoacids into proteid homologous with the individual takes place chiefly in the intestinal wall, and not in the body tissues in general. It is thought that practically all food is given to the blood ready for utilization by the body cells. Whether erepsin is the final fragmenting ferment and especially concerned in the reconstruction process, it is not definitely settled. The old theory, then, of simple hydrolytic cleavage of proteid, with peptone and

albumose as end products, their absorption into the blood as such, and their reconstruction into native proteid by the body cells, seems considerably modified.

It has also been shown that the stimulus to digestive activity depends not only upon nervous influence, but also upon chemical force. Pawlow first showed the secretion of the gastric juice to occur in two phases—primarily, under psychic influences; and, secondarily, he thought, by a local stimulation of the reflex nervous apparatus. Since the second secretion, which is the one that carries on the major portion of gastric digestion, was found to occur after cutting off the stomach from its connections with the central nervous system, it was thought that the cause was to be found in the gastric wall itself and to be of a chemical nature. To determine this Edkins carried out a series of experiments, from which he concludes that the first product of digestion (the psychic juice) acts on the pyloric mucous membrane and produces in the mucous membrane a chemical substance, or hormone, which is absorbed into the blood and carried to the glands of the stomach, where it acts as a specific excitant to secretory activity. This gastric hormone has not been isolated. In support of Edkins's work a process analogous to this has been shown by Bayliss and Starling to take place in the intestine. The observers have shown that when the acid chyme from the stomach comes in contact with the mucosa of the duodenum a chemical substance, not a ferment, is produced, which is absorbed by the blood, carried to the pancreas, and to some extent to the liver, and stimulates these organs to produce their respective secretions. They have named it secretin.

So, beginning with the initial psychic secretion of the gastric juice, by successive hormone activity the process of digestion proceeds to its completion in the intestine.

Application has been made of these new views to both etiology and treatment of disease. Edsall and Wentworth have advanced hypotheses that infantile atrophy is due to a disturbance of ferment and hormone activity, Edsall believing it to be the erepsin and Wentworth the secretin which is at fault.

No doubt there are many clinical conditions with which we can not at present correlate the new ideas. Based on the doctrine that secretin activates the secretion of the pancreatic juice and bile, one would expect severe nutritional changes following gastroenterostomy, but reports from available literature seem to show that these are exceptional. Nutrition in achylia gastrica is difficult to comprehend, as many of these cases are apparently well nourished.

With the possibility that it may also influence the internal secretion, or glycolytic function, of the pancreas, secretin has been used in diabetes mellitus, with results that, while so far disappointing, it may ultimately be of some value.

The etiology of diabetes is still obscure. All observers seem to agree that the pancreas elaborates an internal secretion which bears a definite relation to carbohydrate metabolism. It has been supposed that this secretion is formed in the cell islets of Langerhans, such cells being regarded as a tissue distinct from the alveolar secreting tissue. Recently Dale and certain Russian observers have suggested that these islets but represent phases in the life history of the secreting alveoli and that they are formed from the latter as a result of secretory activity. Whether the pancreatic tissue in its islet stage has special connection with carbohydrate metabolism, or whether the glycolytic functions are carried out by the alveolar cells in addition to and at the same time as their ordinary secreting functions, Starling states we are not yet in position to say.

Cohnheim holds that ingested carbohydrates are burnt up in the muscles, and that this action is activated by the internal secretion of the pancreas, which he believes closely allied in its characteristics to adrenalin, secretin, etc. Attention has also been called to the disturbance of fat metabolism in this disease, its incomplete oxidation giving rise to β-oxybutyric acid and its derivatives. Attention has been especially called to the patient's weight, and no matter what the condition of the urine may be, as regards the excretion of sugar, a patient is doing badly if his weight is progressively diminishing.

Recent anatomical and physiological researches upon the heart have done much to explain perversions of its function with reference to certain of its diseases and arhythmias. Gaskell first showed that contraction traveled from auricle to ventricle through muscular continuity. Later His discovered the auriculo-ventricular bundle of fibers. Purkinje described a network of peculiar gray fibers under the endocardium containing large nucleated cells in the bundles. Tawara has shown that these filaments of Purkinje are the terminal ramifications of the bundle of His, serving as a specialized musculature. Keith, in May, 1907, described his discovery of the "auriculo-ventricular" node in the situation of His's bundle and its continuity through an upper set of fibers with a similar node, the "sinus-auricular," situated at the junction of the superior vena cava with the auricle. This system is thought by Erlanger to supersede the moderator influence of the vagus, which is chiefly concerned in influencing the auricular rhythm. It is believed to control the normal one-fifth second interval between the auricular and ventricular systole, and the various forms of heart block and arhythmia are now thought to be due to dissociated action of this mechanism, and their pathology to lie in the heart rather than in the medulla.

As an outcome of this study increased interest has been manifested in the use of mechanical aids toward graphic representation of the

heart's action. Such instruments we know have never received extended use by clinicians, but methods which eliminate the personal equation in examination should strongly appeal to us. The polygraph, by which one may secure tracings of the heart's action in different places at the same time, has recently been introduced.

The taking of the blood pressure has now become almost as routine a measure as the temperature or pulse beat. A knowledge of it is essential in the treatment of cardio-vascular and renal diseases. Here the sense of touch is notoriously uncertain. With its first impulse only the systolic pressure was sought for, but recently improvements have been made with the object of differentiating between variations of pressure within the compass of a single beat—the systolic and diastolic. Klemperer states that the normal amplitude (which he defines as the difference between the systolic, or size of the pulse, and the diastolic, or tension of the pulse) may decrease from an aggravation of the clinical condition in aortic regurgitation and also in the earlier stages of arteriosclerosis, while the blood pressure itself need not fall. Strassburger and Erlanger regard the amplitude as an expression of systolic volume.

Functional capacity of the heart has been much studied. The subject is well reviewed by Norris. Its size is thought to be the best criterion in this respect. A good deal of attention has been directed to physical methods for determining the size of this organ. One prominent method is that of ortho-diagraphy, which is a complicated method involving the use of the X ray, although very accurate results are claimed for it. Palpatory percussion, which is very simple, is yielding very satisfactory results.

The Nauheim treatment of heart diseases, consisting of baths and exercises, has been somewhat prominent in the literature. Interest in it was stimulated by the recent visit of Doctor Schott to this country. The subject is well reviewed by Kinnicutt. The best reported results are in cases of enfeebled, relaxed, dilated hearts following prolonged and exhausting diseases, and in mitral insufficiency with dilatation. It is said to be of no use in aortic insufficiency.

Interest in arteriosclerosis has been largely centered in its etiology and treatment. Recent contributions somewhat invalidate its experimental production by adrenalin and other substances, as arteriosclerosis has been found in normal animals not subjected to experiment. Nothing new has been advanced in its treatment.

Osler has called attention to the occurrence of angina pectoris as a premonitory and early symptom of aneurism. This is, according to Ewart, correlated with the well-known clinical fact of the painful nature of all arterial lesions, as embolism, thrombosis, and ligation.

Interest in disease of the blood has been principally centered in the so-called malignant conditions—pernicious anemia and leukemia. The more these diseases are studied, with particular reference to their classification, the more intricate do they become. Many cases of grave secondary anemia present the picture of the primary form and have to be excluded. In the leukemias many anomalous cases are reported, complicating the present classification. For instance, a case is reported by Ewald, which showed marked anemia, much enlarged spleen, and no glandular enlargement. The blood showed no changes except a marked reduction of red cells in hemaglobin. Autopsy showed a typical anatomical picture of leukemia. Findlay reports a case in a boy which showed 39 per cent myelocytes and 35 per cent large lymphocytes.

The etiology of both conditions is still obscure. Herter has investigated the intestinal tract for a bacteriological cause of pernicious anemia, and his results seem to point to the occurrence of some cases from bacterial activity. Cures have been reported by colonic irrigation, which lends some support to his work.

Pernicious anemia is now divided by writers into two types—the plastic and the aplastic, based on the reactive powers on the part of the bone marrow to compensate for the destruction of red cells in the one, and its absence in the other. The plastic type is the ordinary form and is accompanied by distinct reaction, manifested by elements in the circulating blood recognized as being formed in the bone marrow—nucleated reds, myelocytes, etc.

In the aplastic type there is complete absence of medullary reaction and young cellular forms in the circulating blood. This absence is thought to be due to a degeneration of the elements in the bone marrow, or a failure to form them. The subject has been studied by Lavenson, who gives as the essential features of the aplastic type a rapidly fatal course; marked reduction in the number of red cells; a greater proportionate reduction in the hemaglobin, with a low color index; leucopenia with relative lymphocytosis; absence of megaloblasts and usually normoblasts. The description of this type is of interest in two respects: First, in the prognosis, being rapidly fatal; and, second, that a pernicious anemia may exist without the usual blood findings given in the text-books.

In leukemia the interest has been principally centered in treatment by the X ray. While probably none of the cases have been cured, good symptomatic results have been reported. The myeloid cases are the ones most benefited. Formerly this treatment was based on empirical grounds alone; it was then shown that the X ray has a selective action on the leucocytes, and recently Capps and Smith have demonstrated a lytic power in the serum of patients treated by

the X ray, the strength of which is proportional to the degree of clinical improvement of the patient. They found that injections of strong leucocytic serum into another individual with leukemia not under X ray treatment caused a decided and rapid fall in the number of leucocytes, the mononuclear cells being principally affected. With repeated injections a partial immunity to the serum was established.

We are still ignorant of the real nature and cause of cancer. Much experimental work has been done and is at present under way. The theories of Doyen, Beard, and others recently brought before the profession are discredited. Gaylord and Clowes report 101 cases of spontaneous recovery from cancer in mice, and have collected 14 cases of authentic spontaneous recovery in man. The fact that spontaneous recovery may take place may serve to explain cases of reported cures under the various therapeutic measures advanced in the past.

The contributions in tuberculosis have been very numerous. The method of pulmonary infection in this disease still continues to be much discussed. The theory of the French school, headed by Calmette, as to its origin from the intestine, has been strenuously opposed. The Royal Commission of England, in its recent report, refutes the statement of Koch that human and bovine tuberculosis are different, and that human beings can not be infected with the bovine bacillus. Our own Department of Agriculture, it is gratifying to record, decided this some time ago. Raw has recently stated that the bovine type occurs through the intestine and the human through the lungs. He thinks an antagonism exists between the two types of bacilli, and reports successes in treatment by using the opposing tuberculins.

Early diagnosis is recognized as of first importance, but new aids to it are lacking in the literature. Tuberculin as a diagnostic agent should be more frequently employed.

In the matter of treatment, aside from diet and hygienic measures, the use of tuberculin is prominently before us; that is, its use in pulmonary cases. Like many other good things, it suffered from overexploitation and ignorance of usage in the beginning. There is now a conservative use of this agent, and gratifying results are reported by various writers. Sahli is an enthusiastic advocate of it. Trudeau reports good results, most marked in the advanced cases. He calls attention to the principal faults in the application of it, which are: Beginning the treatment with too large an amount, raising the dose too rapidly and at too short intervals, and neglecting to consider the signs of reaction, which calls for an interval of rest and reduction of the dose. The best method seems to be to begin with minute doses and increase gradually and at such intervals as to carry the patient to full dose with as little disturbance as possible. The patient while taking the injections should show no depression of general

health, should have no fever above the usual temperature range, and should show no irritation at site of injection. As a rule, the good results are not obtained until the tuberculin has been used five or six months. Rosenberg reports observations on 90 cases treated at the Bedford Sanitarium, and concludes that, judiciously administered, they have been able to obtain better results than with ordinary methods. In all cases there was decided and uniform improvement in subjective symptoms.

The exanthemata still remain mysteries. That their causation is within the realm of parasitology no one questions. Possibly what we need is a stain that will show them, as in the case of the tubercle bacillus.

Attention has been directed to the dangerous powers of house flies and other insects as carriers of disease. Our greatest attention heretofore has been where they have acted as intermediate hosts, as in malaria and yellow fever; but mechanical transmission of disease-producing organisms is well established and should warrant our consideration.

The relation of protozoa to disease is daily becoming more apparent.

The treatment of respiratory affections by cold air is receiving wide recognition and application. Its beneficial effects are thought by Northrop (its principal advocate) to be due to the stimulation of the cold rather than the oxygen.

In typhoid fever the different modes of infection have attracted the most attention. The problem seems a long way from solution as yet. Cases continue to develop, despite improved water supply and every other precautionary measure. Coleman and Buxton report a bacteriological examination of 1,602 cases. They conclude that the lymphatic system is primarily affected and that the disease is due to overflow of bacilli into the blood, where they perish, liberating endotoxins, which produce the symptoms, and further, that the bacillemia in the disease does not constitute a true septicemia, but represents an overflow of bacilli from the lymphopoietic organs.

Mention should be made of blood cultures in this disease as a means of early diagnosis. Also the fact that a more liberal diet is gradually finding favor.

Good results are reported by Comby in the treatment of post-diphtheritic paralysis by antitoxin.

The bacteriology of whooping cough has been extensively studied by D. J. Davis, who reports finding an influenza-like organism in 56 of 61 cases examined. His conclusions are that with the evidence at hand no definite statement can be made for or against its specificity in the disease.

In the field of physical diagnosis Grocco's sign in the diagnosis of pleural effusions seems the most conspicuous addition. This is an occurrence of a paravertebral area of dullness on the sound side, due to protrusion of the posterior mediastinum. It has been found to be rarely absent, and is of particular value in encapsulated effusions. The subject is favorably reviewed by Thayer and Fabyan.

Vaccine therapy and opsonins continue an all-absorbing theme. The value of the opsonic index has been much discredited in this country, as will be recalled from the symposium at the recent meeting of the Association of American Physicians in this city. However, it seems that Wright continues to get good results in certain classes of cases with bacterial vaccines, and their dosage and method of administration have been regulated by this index.

No doubt there are many cases that will not yield to this therapy, as is the fact with nearly everything else, but these should not invalidate the good results that have been accomplished in conditions heretofore amenable to no other treatment.

It is to be regretted that this work is at present practically confined to specialists and can not be carried out by the profession at large, but there seems reason to believe that out of the present intricacy of technic will be evolved a clinical working basis, and mankind in general be enabled to profit by a wonderful discovery.

HOLMES, C. R. **Etiology of erysipelas.** Boston Medical and Surgical Journal, April 23, 1908, pp. 551–552.)

According to C. R. Holmes the frequency of erysipelas of the face has long suggested an intra-nasal origin for at least a majority of the cases. He calls attention, therefore, to the necessity, often overlooked, of careful treatment of the nose, especially in cases of recurrent erysipelas.

WASSERMANN, Doctor Michael, and MEIER, Doctor Georg. **The clinical application of the serum diagnosis in syphilis.** (Deutsche Mediz. Wochenschr., No. 32, 1907.)

The great value to diagnosticians of the biological reaction of Bordet and Gengou, recorded about eight years ago, is derived from the very ingenious method of its application by A. Wassermann to the class of infectious diseases, the causative agents of which are either entirely unknown or refuse to be cultivated on artificial media (syphilis, lepra, yellow fever, variola, and other protozoal diseases). The test has recently been applied with especially fortunate, if not altogether surprisingly good, results to syphilis and its remote and

obscure consequences and lesions, which up to that time it had been impossible to diagnose with any degree of certainty. It would seem, therefore, very desirable that the readers of this bulletin, to whom the special journals in which most of the important papers treating of this subject have been published are inaccessible, should at least have their attention called to it.

The test is based upon the well-known fact of the existence of a specific selective affinity between related amboceptors and antigens, and upon the further fact that after the combination between such amboceptors and antigens has occurred a certain amount of complement, present in the fluid at the time, becomes fixed in the combination, or, in the language of Ehrlich, becomes anchored to it. Consequently, when a certainly known antigen is mixed with a body fluid containing an unknown amboceptor (antibody) this test has made it possible for us to tell for certain whether this unknown amboceptor fits into our known antigen from the further fact, to be established at the same time, whether any complement (fresh normal serum) added to the combination becomes fixed in it or whether it does not. In the case in which the complement becomes fixed and our known antigen consisted in some infectious disease germ, we may conclude that the person from whom the fluid containing the unknown amboceptor was taken was at the time suffering from an infection by the same known antigen or infectious germ used in the test. In the case in which the complement does not become fixed, but remains free and available, the above conclusion can not be made.

It will therefore be seen that the important factor in the problem is to find out whether the complement added to the mixture of antigen and amboceptor has disappeared from it or not. In order to establish this fact a different amboceptor is added to the mixture, one that has the power of dissolving certain red blood corpuscles added simultaneously, and which, likewise, needs complement for producing this effect. When, therefore, the available complement had become fixed in the first combination, it has ceased to be available for entering into combination with the second or hæmolytic amboceptor, and consequently the red blood corpuscles remain undissolved. When, on the other hand, the body fluid under examination, in the first mixture, did not happen to contain a fitting or related amboceptor for our known antigen, so that no combination between the two could take place, and consequently none of the added complement could become fixed, then that complement remained available for entering into combination with the hæmolytic system, effecting the solution of the red blood corpuscles, a fact easily noted by the change in color of the contents of the test tube.

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Drs. M. Wassermann and G. Meier, in their experiments, made use of extracts from syphilitic organs, such as fetal livers, etc. (syph. antigen), blood serum, or lumbar fluid from syphilitics (syph. antibodies), and fresh serum from guinea pigs (complement). As indicator, they employed a hæmolytic serum with its related erythrocytes.

Antigen.—The details of the preparation of these extracts must be looked up in the original article. Suffice it to say here that the extracts must be clear; they must, in the proportion of 0.2 c. c. of the extract to 0.1 c. c. of syph. serum, produce a complete inhibition of hæmolysis. Two-tenths c. c. of the extract, when mixed with 0.2 c. c. of normal human serum must result in complete hæmolysis. The extract by itself used in the amount of 0.5 c. c. must not inhibit haemolysis, and, if it should do so, it must be diluted.

Antibodies.—The blood serum must be heated for one-half hour to 56° C., in order to inactivate it—that is, to destroy its complement; the same is done of course with other fluids. This fluid also must be clear and not contain any erythrocytes.

Complement.—Fresh guinea pig's serum is used in a dilution of 1 : 10.

Hæmolytic serum.—As hæmolytic serum, a serum from rabbits was used, which had received several times, intravenously, washed sheep's erythrocytes, until the serum had reached a high titer. The serum is inactivated and employed double strength—that is, its titer being 1 : 2000, it is used in a dilution of 1 : 1000. As blood, a 5 per cent suspension of sheep's erythrocytes, washed several times with normal salt solution, is used. The blood ought to be fresh, so that no hæmoglobin may pass into the fluid.

A system control, which, the authors say, must never be omitted, must show that complement and haemolysin produce a complete solution of the erythrocytes. Their work was done with five reagents, each one of which was diluted up to 1 c. c., and consequently there were 5 c. c. of fluid in each test tube. In the system control, in which only three reagents are used, 2 c. c. of normal salt solution are added in order to bring its contents up to 5 c. c.

System control.

Complement. 1:10 1 c. c.	Hæmol. serum. 1:1000 1 c. c.	Blood. 5 per cent sheep's erythrocytes. 1 c. c.	2 c. c. 0.85 per cent. Na Cl.	Result, complete solution.

It will be easily understood that no inhibition of hæmolysis must appear in this experiment. An example of a protocol is shown in the following table. The problem before us is to determine whether

in the lumbar fluid of the patient P. there are contained syph. antibodies.

Example of protocol.					Results.
1. Lumbar fluid, P. 0.2 c. c.	Syph. extract 0.2 c. c	Compl. 1:10, 1.0 c.c.	Hæmol. comboc. 1.0 c. c.	Blood 5 per cent 1.0 c. c.	Complete inhibition.
2. P. 0.2 c. c.....	Extract from normal liver 0.2 c. c.	...do	.....do	.....do	Complete hæmolysis.
3. P. 0.2 c. c.....	NaCl. 0.85 per cent 1.0 c. c.	...do	.....do	.....do	Do.
4. P. 0.4 c. c.....	.....do	...do	.....do	.....do	Do.
5. NaCl. 0.85 per cent 1.0 c. c.	Syph. extract 0.2 c. c	...do	.....do	.....do	Do.
6. NaCl. 0.85 per cent 1.0 c. c.	.....do	...do	.....do	.....do	Do.
7. Lumbar fluid, non-syphilitic 0.2 c. c.	.....do	...do	.....do	.....do	Do.
8. Syph. lumbar fluid 0.2 c. c.	.....do	...do	.....do	.....do	Complete inhibition.
9. Syph. lumbar fluid 0.2 c. c.	Normal liver extract 0.2 c. c.	...do	.....do	.....do	Complete hæmolysis.
10. System control....		(See above.)			

It will be seen from the foregoing table that for every tube in which the test proper is carried out, we require 8 control tubes. Control tube 2 shows that no inhibition to hæmolysis occurs with normal liver extract. Control tube 3 shows that the fluid under examination, by itself alone, does not fix complement, as is shown also in control tube 5 with syphilitic extract alone. Control tubes 4 and 6 prove that inhibition does not depend upon summation. Control tubes 7 and 8 show that the syphilitic extract used gives inhibition when the material employed is undoubtedly syphilitic. Control tube 9 shows that normal liver extract with undoubtedly syphilitic material does not fix complement; and, finally, tube 10 indicates the use made of the hæmolytic system.

In carrying out an experiment of this kind the syphilitic extract is mixed with the fluid to be examined and complement is added; the mixture of these three substances is allowed to stand for one hour at 37° C.; whereupon the hæmolytic serum and the blood are added, after which addition the tubes are set aside once more for two hours at 37° C. The results are best shown when the tubes were allowed to stand for twelve hours on ice. The undissolved erythrocytes are then shown to lie at the bottom of the tubes and a clear fluid is seen above them; while in the tubes in which hæmolysis has occurred the supernatant fluid exhibits the color of red wine.

Twenty-seven of the 39 cases examined gave a positive and 12 a negative result. All the 39 cases were cases in which no diagnosis could be made by clinical examination alone. Among the positive cases were some of general paralysis, locomotor ataxis, aortic aneurisms, etc. Interesting was the discovery of syphilitic antibodies in three cases of human milk.

Basing themselves upon the results of their experiments, the authors are satisfied that syphilitic antibodies may be demonstrated in the blood serum of certain cases of syphilitics.—(*Medical Inspector H. G. Beyer.*)

CASTELLANI, ALDO, M. D. **Comparative experimental studies on cases of frambœsia, contracted in various parts of the Tropics.** (Archiv f. Schiffs-und Tropen-Hygiene, 1908, Bd. 12, No. 10, p. 311.)

Castellani, by applying the reaction of Bordet and Gengou, according to the method of Wassermann, Neisser, and Bruck, was able to demonstrate specific frambœsia antigen and antibodies. It is well known that frambœsia is known under various names in different parts of the Tropics. In Ceylon the disease is called parangi or yaws; in the British Antilles and in most other British colonies, yaws; in the French Antilles and other French colonies, pian; in the Malay States, puru; in the Fiji Islands, coco; in Venezuela and Brazil, boubas, etc. The cases observed by Castellani were the following:

1. Puru. Three cases from the Federated Malay States.
2. Coco. Two cases, an Indian cooly and his wife, returning from the Fiji Islands after twelve years' residence there. The disease was of eleven months' duration.
3. Pian. One chronic case from the French Antilles.
4. Boubas. One case (a mulatto) from South America (Brazil).
5. African frambœsia. Two cases (negroes) from East Africa.

Castellani, after having demonstrated the presence of Treponema pertenue in all these cases, showed by experiments that—

1. Ceylon monkeys (*Cercopithecus priamus* and *Mocacus pilcatus*) are susceptible to puru, coco, pian, boubas, African frambœsia, just the same as to Ceylon frambœsia.
2. Monkeys, successfully inoculated with Ceylon frambœsia, become immune to coco, puru, boubas, pian, African frambœsia, and vice versa.
3. Monkeys successfully inoculated with coco, or puru, or boubas, or African frambœsia, or pian, or Ceylon frambœsia, do not become immune for syphilis.
4. Monkeys successfully inoculated with syphilis do not become immune for either Ceylon frambœsia, or puru, or coco, or pian, or boubas, or African frambœsia.

In some further experiments Castellani was able to show that the Asian frambœsia antigen and antibodies were identical with African and American antigen and antibodies. In these experiments the extract of nonulcerated papules of a Ceylon frambœsia case was used and some serum, heated to 55° C. was added; this serum was derived from a monkey which had been successfully inoculated with Fijian frambœsia (coco), using scraping from papules of one of the Fijian patients: the monkey had been afterwards treated at proper intervals with subcutaneous inoculations of extracts of papules of the same Fijian patient, and, after a certain time, some sensitized red blood corpuscles, in his experiments goat's corpuscles, treated with

inactivated serum from a rabbit which had been inoculated several times with goat's corpuscles. Result was, no hæmolysis. The experiment was repeated, using the extract of papules taken from seven other cases of Ceylon framboesia. The result was constantly the same; namely, no hæmolysis. The same experiment was repeated, using the extract from the papules of Ceylon framboesia with the serum from the cases of puru, coco, pian, boubas, etc., always with uniformly positive results, namely, no hæmolysis. When, instead of serum from framboesia patients, serum from monkeys, immunized against syphilis was mixed with the framboesia extract, well-marked hæmolysis was the result.

These investigations prove that yaws, pian, boubas, puru, etc., are merely synonymous terms for the same disease, namely, framboesia. They also would show, incidently, the nonidentity of syphilis and framboesia.—(*Medical Inspector H. G. Beyer.*)

GOODALL, HARRY W., M. D., and BELKNAP, J. LYMAN, M. D. **A study of the value of measurements of chest expansion.** (Boston Medical and Surgical Journal, vol. clviii, No. 20, pp. 761–765, May 14, 1908.)

Some studies of chest measurements have convinced the authors that the usual measurements do not afford true evidence of lung expansion, and considerable error in the interpretation is liable to occur. The authors hold that measurements of chest expansion without corresponding abdominal measurements, to ascertain the position of the diaphragm, have no comparative value. The part played by the contraction of the abdominal walls in elevating the diaphragm and forcing the abdominal contents upward has led the writers to believe that a normal person, with lungs at full expiration and again at rest, may, while holding the breath and without further intake of air, so shorten the vertical diameter of the chest by abdominal contraction as to increase his chest circumference. Such increase in chest circumference results, therefore, from muscular contraction pure and simple, and is not due to an increased intake in the amount of air. Their tables appear to illustrate these points fairly well. The authors' conclusions assume considerable importance to physical examiners when they show that as much as 50 per cent of the increase in chest circumference during maximum expansion may be due to changes in the shape of the thoracic cavity, brought about by muscular contraction alone. From the observed facts it would undoubtedly follow that from chest measurements alone it would be an error to conclude that a supposedly normal individual with a chest expansion of less than 2 inches has an abnormally diminished respiratory capacity or that another individual with an expansion of over 2 inches has an absolutely normal respiratory capacity.—(*Medical Inspector H. G. Beyer.*)

HYGIENE AND SANITATION.

By Medical Inspector H. G. BEYER, U. S. Navy.

CROWE, S. J. **On the excretion of hexamethylenamin (Urotropin in the bile and pancreatic juice.** (Johns Hopkins Hospital Bulletin, April, 1908.)

The results of Crowe's experiments are briefly stated as follows: (1) Hexamethylenamin when administered by the mouth is readily absorbed and remains in the circulating blood for twenty-four hours. The maximum concentration in the blood is apparently reached in five to eight hours after giving the drug. (2) It is excreted in the bile, pancreatic juice, and, in dogs, directly through the wall of the gall bladder. (3) It was found to be present in the saliva and milk of dogs after the intravenous administration of 1 gram.

As a result of some further studies of the bile obtained from patients with bileary fistulæ, before and after giving hexamethylenamin, the results are summarized as follows: (1) After its administration by the mouth hexamethylenamin appears in the bile and pancreatic juice of dogs. It finds its way into the bile both through the liver and through the wall of the gall bladder. (2) It has been demonstrated in the bile, synovial fluid, saliva, pleural effusion, and blood of man. (3) When given in sufficiently large dose (75 grams per diem), it appears in the bile in quantities which suffice to exercise a decided bactericidal action.

In addition to its value as a genito-urinary antiseptic, the experimental results of Crowe would indicate that hexamethylenamin will probably be efficient in the following conditions: (1) Acute infections of the gall bladder. (2) Convalescence from typhoid fever, where the advantage would be twofold, (a) as a prophylactic measure against the subsequent formation of gall stones; and (b) more important still, by sterilizing the gall bladder and thus preventing the patient from becoming a chronic bacillus carrier, a menace to the community. (3) Before gall-bladder operations as a prophylactic measure.

KENDALL, ARTHUR I., Ph. D., Acting Chief of Laboratory of Board of Health, Isthmian Canal Commission. **Experiments in practical culicidal fumigation.** (Bulletin No. 2, Washington, 1906.)

In this valuable contribution to culicidal fumigation, an important subject in the yellow-fever zone, Kendall, by modifying the apparatus for fumigation, has shown us how to use camphophenique to the best advantage, and with more perfect safety. Although this valuable culicide had been used before and Doctor Berry of the Marine-Hospital Service had reported favorably on its use, the great trouble had been in the danger of the mixture catching fire.

Camphophenique consists of a mixture of equal weights of camphor and 95 per cent carbolic acid. It is made by dissolving camphor in

carbolic acid of the strength mentioned, using 2 ounces of camphor and 2 ounces of the acid to each thousand cubic feet of space to be fumigated. The camphor dissolves with considerable readiness, forming a solution which occupies twice the volume occupied by the acid. The solution is usually rather milky at first, due largely to the inclusion of air bubbles during the process of stirring; but it soon clears up, particularly if it is heated, forming a light yellow fluid. It is extremely oily and unpleasant to handle because of its strong corrosive action on the hands and other parts upon which it may be spilled. Fortunately, one always has alcohol in which to bathe the affected part, because alcohol lamps are used as the source of heat when this substance is volatilized.

The camphor mixture is placed in shallow pans, in the quantities mentioned, and subjected to the heat of an alcohol lamp. The fumes come off in clouds, accompanied by the characteristic odor. The great advantages of this substance are: Its cheapness as compared with pyrethrum; the fact that it may be generated quickly, taking rather less than an hour for complete volatilization; the fact that it is not objectionable in its action to the householder, depositing neither soot nor injuring the finest fabrics, and the fact that its odor disappears very quickly after the house is opened up. Herein lies its great advantage.

It was observed that the fumes killed mosquitoes with great rapidity, and that the insects were actually dead, not merely stupefied, as is the case with pyrethrum. The principal point in the modified apparatus is the fumigating pan. This is made of sheet iron 7 inches in diameter, which makes it larger than the stand upon which it is supported; its section is concave, with the edges turned down, in order to prevent the flame from setting the fumes on fire. The whole apparatus is made as cheaply, durably, and easy of transportation as possible. It is so constructed as to permit its use by unskilled labor, with the minimal chance for damage both to itself and to the house or other structure in which it may be used. The results obtained are spoken of as practically perfect, and summarized as follows:

1. Camphophenique in well-constructed houses is a cheap, efficient, and nonobjectionable culicide, possessing, particularly when combined with formaldehyde, good bactericidal properties as well.

2. Sulphur is an excellent culicide, but is very injurious to fine fittings and fabrics.

3. Pyrethrum is not a reliable culicide and causes darkening of light-colored paint and similar substances.

4. The apparatus described gives excellent results with camphophenique, while all other appliances have entirely failed in this respect.

5. All three culicides have a certain effect on fruits, although the camphophenique was less injurious than either of the others.

6. Certain physical factors: Wind, leakage, large connected rooms, in which no precautions are taken to break up the air currents, as well as surface condensation, affect seriously the results of fumigation and should be considered in detail when undertaking culicidal fumigation.

WALKER, J. T. AINSLIE. **Formalin as a disinfectant.** (Letter to the editor of the Lancet, April-18, 1908, p. 1177.)

This letter was intended as an answer to one of the correspondents, who asks for references to articles or records of experiments indicating the value of formalin as a disinfectant. Mr. Walker writes to the Lancet as follows:

It is clear that fumigation with any body of such low germicidal strength must be a most unsatisfactory method of disinfecting ships. The same remark applies to fumigation with SO_2. Nearly thirty years ago the whole question of the disinfectant value of this gas (SO_2) was investigated in Germany by Koch, Wolfhügel, Huppe, and Proskauer, and the report of these experts stated that sulphur dioxide, with or without water, dry or damp, was entirely useless for the disinfection of spores and quite unreliable for the disinfection of sporeless organisms in the presence of any superficial protection. It was further demonstrated that in practice the unequal diffusion of the gas and its loss through various causes rendered the disinfectant value much less than in the laboratory experiments, and these scientists strongly recommended that disinfection by sulphur dioxide should be entirely abandoned. Dujardin-Beaumetz, Cassedebat, Sternberg, and others have described the use of this gas as wholly unreliable, a farce, and simply ridiculous. The vapors of formalin and sulphur dioxide, lacking, as they are, so largely in germicidal efficiency, are now superseded by the application of liquid disinfectants of high coefficiency. A mop or spray and warm watery dilution of one of these form the most effective implements for the disinfection of the various apartments, berths, etc., aboard ship.

DAVIDOVICS, Dr. JOSEF. **On slow and rapid tobacco smoking.** (From the Hygienic Institute, University Budapest, Dir. L. von Liebermann.)

It has always been a popular impression that the effects of rapid smoking are greater than those of slow smoking. The experiments of Davidovics were undertaken with the view of testing the correctness of this popular notion. The experiments were made with a uniform brand of cigars, which were dried, put into a glass cigar holder which was connected with a long glass tube containing absorbent cotton, and which tube was, in its turn, connected with an aspirator. When the apparatus was connected, the aspirator was started and the cigar carefully lighted. The weight of the cigars and the dark, tar-like mass that had collected on the cotton were, of course, carefully

and accurately ascertained. It was found, both with continued and interrupted smoking, that rapid smoking resulted in from 3–4 times the amount of the dark, tar-like material on the cotton than was obtained by slow smoking. Since K. B. Lehmann, in his studies on tobacco smoke, has previously shown that practically all the poisonous substances in it are to be found in that dark-brown, tar-like substance, the hygienic difference between slow and rapid smoking may be easily inferred.

WEICHARDT, Dr. Walfgang, Privatdocent. **Über Ausatemluft on expired air** (Arch. f. Hygiene, Bd. 65. Heft 3. S. 252. 1908.[a])

Notwithstanding the fact, to no one better known than to v. Pettenkofer himself, that an atmosphere containing 10 per cent CO_2 was not directly hurtful, he taught us to consider an atmosphere containing 1 per cent, or one-tenth the above amount, as bad. In other words, the really hurtful portion in the air was some undetermined substance, for the presence of which the gradual accumulation of CO_2 formed only our standard of measurement. It is with this unknown and undetermined substance in expired air that many of our cleverest hygienists have occupied themselves in times past without complete success.

The question was asked, Is this deleterious substance in the air a poisonous substance, escaping all our ordinary chemical reagents, or is it the result of an accumulation of normal substances? Thus Seegen and Nowack, Brown-Sequard, and d'Arsonval, as well as Merkel, came to the conclusion that the substance in the air was a poisonous, volatile base; Herrmanns believed that it originated from the accumulation of organic substances from the skin and clothes; Formanek, as did Dastre and Loye, Hoffmann, von Wellenhof, Geyer, Russo, Giliberti and Alessi, Lehmann, and Jessen before him, concluded, after considerable experimenting, that the deleterious effect of foul air was due to the presence in it of ammonia compounds. Thus the theory of the existence in vitiated air of an anthropotoxin appeared to be abandoned.

In 1903 some very interesting observations on this subject were published by Wolpert, in which the author showed conclusively that the excretion of CO_2 for a given time is considerably diminished in men obliged to breathe their own expired air over and over again. Peters also discovered a peculiar unknown substance in the water of condensation from expired air, which gave rise to a slowing in the rate of the isolated frog's heart. The question of a toxic substance in expired air had thus been revived once again.

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[a] From the Hygienic-Bacterol. Inst., University Erlangen, Dir. Prof. Dr. Helme.

Heymann, Paul, Erklenty, and afterwards Flügge, repeating many of the experiments of Wolpert, thought that Wolpert's observed phenomena could be sufficiently explained on the theory of heat accumulation and need not be due to the presence of a "specific something" in expired air; hence a generally satisfactory explanation for Wolpert's observations was lacking.

In the meantime Weichardt had succeeded in showing that a high-molecular protein-cleavage antigen of the character of fatigue toxin (kenotoxin) was demonstrable in various solid and liquid excreta and in traces also in the expired air. Since this kenotoxin, when injected into animals, gives rise to a slowing of the respiration and, in large doses, completely arrests this mechanism, the existence of a causal connection between this substance in expired air and the lessened excretion of CO_2 noted by Wolpert was at once suggested.

The object of Weichardt's experiments was to furnish a scientific basis for this fact. Purified kenotoxin, when injected into animals, produces sopor; a lowering in the temperature; a slowing of the respiration, stopping the latter altogether when taken in large doses; while the heart continues to beat a while longer. Small doses are followed by a light form of sopor, after which complete recovery takes place, and the animals, after such treatment by light doses, are protected against the effects of larger doses of pure kenotoxin for some time thereafter. Weichardt, moreover, succeeded in producing an antibody, the antikenotoxin. It is by means of this antibody that he was able to prove the presence of kenotoxin in the expired air, through the difference in the effects produced by it on animals treated by this specific antibody and those who had not been treated by it.

Weichardt found that the kenotoxin discovered by him is a most unstable compound, and he therefore is inclined to attribute the varying results obtained by the different experimenters who preceded him in this line of research work to the varying length of time they took in their experiments and the high temperatures that they used in the chemical processes. It was only through the most careful attention to such details that Weichardt succeeded in producing a pure kenotoxin, showing its characteristic effects.

Experimental technique.—The expired air is passed through a certain amount of water, which is acidulated by a drop of HCl; the quantity of water used is concentrated in a vacuum at 30° C. down to 2 cubic centimeters, neutralized by N_aOH, and dialysed; the isotonic liquid is then centrifugalized, and one half of it is injected under the skin of a normal animal, the other half into one previously immunized by antikenotoxin. The nonimmunized mouse shows great sopor, very slow breathing, and a temperature of 30° C., while the other shows nothing abnormal and maintains a body temperature of 37° C.

For investigating the expired air of mice and guinea pigs, Weichardt employed a very ingenious apparatus, giving the most direct and absolute results; by indicating the exact quantity of CO_2 produced by the animal it was easy to calculate it, not only for a given time, but also for one act of respiration. Besides this, simply weighing Liebig's apparatus gave the amount derived directly and independently from the CO_2 content of the external air, with temperature and barometric pressure.

The following illustrates a typical experiment: Three average mice were treated as follows: One was actively immunized by a small dose of kenotoxin; another was passively immunized by getting, per os, a small quantity of antikenotoxin; a third received no previous treatment, remaining normal. All three of them then received one-third each of the dialysed, isotonic vacuum-remnant, subcutaneously injected. Fifteen hours after the injections the third or normal mouse was deeply soporose; its respirations very slow (103 per minute); its temperature was 30° C., and the secretion of CO_2 in the apparatus gave a value of 1,954 l. per kilogram and per hour. The mean value established by the author for normal mice under the same external conditions was 4,585 l. per kilogram and per hour. Both the other mice under observation continued as lively as before; respiration and temperature of both remained normal, and the excretion of CO_2 was 4,951 l. in one of them and 5,058 l. per kilogram and per hour in the other; hence slightly above the established mean value. Indeed, the amount of decrease in CO_2 in the animal under the influence of kenotoxin was large enough to be compared to the decrease we get from such an animal during hibernation.

Highly interesting is the additional fact that these animals after an exposure for hours to the stupefying effects of kenotoxin recover promptly and completely. The poison, therefore, can not well be called a violent one, in spite of the fact that it does interfere profoundly with the very functions upon which life depends.

Inasmuch as we must assume that residual air contains a certain amount of this kenotoxin, it is easily understood that interference with respiration, due to chemical or physical agents, causing shallow breathing, etc., indirectly assists the action of kenotoxin and perhaps helps to bring about certain effects of chronic kenotoxin intoxications, thus partially explaining at least some of the ill effects of bad ventilation and of a sedentary life.

REPORTS AND LETTERS.

INTERNATIONAL CONGRESS OF PHYSIOTHERAPY.

Medical Inspector H. G. Beyer represented the Medical Corps of the United States Navy at the meeting of this Congress, which was held at Rome, Italy, October 13–16, 1907.

In his report Doctor Beyer gives a brief review of the organization and then proceeds as follows with a detailed account of the work of the congress:

THE CONGRESS.

The International Congress of Physiotherapy, held at Rome on October 13–16, 1907, being but the second of its kind, was a small one, so far as the number of those present is concerned and as compared to congresses of other organizations that are considerably older. Physiotherapy, or physical therapeutics, as defined by this congress would include the treatment of disease and disease processes by all physical agencies, as distinguished from pharmacological means and methods. It includes all forms of electricity and magnetism, X and other rays, radium and radioactive substances, of all forms of active and passive exercise (gymnastics, massage), all methods of applying heat and all forms of light (both white and colored, electric as well as solar), waters of all kinds and all temperatures (mineral as well as ordinary, administered internally and externally). Some authors include diet in this definition.

On account of the influence of all these physical agencies upon the normal regulating mechanisms of the living organism, partly modifying, partly reenforcing them, a certain hygienic significance can not be denied them, and they can be made to prevent as well as cure disease. This view was more especially advanced by Professor Goldscheider, of Berlin, and by Doctor Corsini, of Florence.

The subject of arterio-sclerosis and its treatment by dietetics, aided by the various methods of physiotherapy, was very cleverly handled by Huchard, of Paris, and by Ascoli, of Rome. For Huchard many of the forms of arterio-sclerosis are toxic in origin and associated with different degrees of renal insufficiency. Abdominal massage, according to Huchard, regulates arterial pressure, increases diuresis, promotes disintoxication, and forms an important promoter to the action of pharmacological agents.

A very clear and instructive account of muscular exercise as applied to the treatment of disease was given by Doctor von Hovorka, of Vienna. This, while perhaps containing nothing that was new to the congressists, was a good summary of the subject, putting it into a clear light. The same subject was spoken of by Doctor Gualdi, of Rome.

Professor Thiem, of Cottbus, and Doctor de Munter, of Liege, spoke of the curative influence of physiotherapeutical methods upon accidents and injuries occurring in the course of the exercise of the different trades and professions. Their preventive action on traumatic neuroses was more especially emphasized. Early treatment by physical agencies would have a positive preventive action on these neuroses, which, when left untreated, become more or less permanent. Doctor Bernacchi, of Milan, showed by statistics the number of deformities from accidents which he had been able to prevent through systematic and timely applied massage, aided by some of the other physiotherapeutical means, and von Lutzenberger showed that many forms of paralysis due to peripheral neuritis, usually caused by certain nerve injuries, could and actually had been prevented by the application of mechanical treatment of the parts.

Professor Brieger, of Berlin, advanced some very sound arguments in favor of the whole subject of physical therapeutics being taught at universities in special courses by a separate chair, and that an examination in the different branches of it be made one of the requirements for the degree of doctor in medicine. This, indeed, was the unanimous opinion of all the delegates and members present. The number and kinds of the apparatuses to be studied and the amount of special knowledge that had to be acquired for the purpose of handling these intelligently and successfully were indeed so great that a special course of instruction had become indispensable. It was furthermore concluded that on account of these same difficulties, and for the same reasons, none but such physicians as had received this necessary instruction and training should be authorized to administer any form of physical therapeutics. The harmful effects of such treatment on certain patients by nonmedical men and women were abundantly shown and recorded. The above-named subjects, being of general interest to all congressists, were discussed in plenary sessions.

WORK OF THE SECTIONS.

October 14, 1907.

High frequency currents.—Doctor Laqueur, of Berlin, showed that arsonvalization had produced very favorable results in pruritic skin affections and certain forms of neuralgias; it had done no appreciable good in cases of well-advanced arterio-slerosis. No essential

and very marked influence on the blood pressure had been produced, sometimes even a slight after rise had occurred. In young subjects, however, in the praesclerotic stage, an objective lowering of arterial pressure did occur, and this was accompanied by a more decided subjective improvement. Certain forms of organic disease of the heart without arterio-sclerotic complications, were benefited by the application of an electrode condensor over the region of the heart.

Doctor Sloan, of Glasgow, recommends particularly the application of the upper part of the resonator in the treatment of several affections, giving an account of his experiences on perverted cell metabolism in neurasthenias, diabetes, rheumatism, insomnia, and gastro-intestinal affections.

Doctor Bonnefoy, of Cannes, recommends this form of treatment in all cases depending upon an abnormal slowing of the nutritive processes, such as rheumatism and gout, biliary and uric acid lithiases, certain forms of pulmonary asthma and emphysema, of diabetes, of eczema and psoriasis.

Doctor Vassilides, of Athens, thinks that all those diseases to which this form of treatment applies would fall under the head of " Diseases of the great sympathetic," namely: (a) Circulatory manifestations, such as chronic myocarditis, angina pectoris, etc.; (b) perverted nutritional manifestation, as arthritis, gout, uric acid lithiasis, diabetes; (c) nervous manifestations, as neurasthenias, megraine, myxoedema, goiter; (d) cutaneous manifestations, as scleroderma, eczemata, pruritic affections, etc.

Dr. Tommaso Lucrezio, of Poggiardo, is of the opinion that most of the effects of this form of treatment may be explained by the active hyperæmias which accompany them and which, according to Bier, produce their great beneficial effects mainly by profoundly modifying cellular assimilation and dissimilation.

Education and reeducation of the pulmonary function through gymnastic movements.—Dr. F. Gommaerts, of Liege, recommends both manual and mechanical gymnastics, and would have them divided into: (1) Normal respiratory movements, voluntarily but methodically done; (2) respiratory exercises, accompanied by movements of the head, as inclinations and rotations; (3) respiratory exercises, aided by movements of upper or lower extremities, either separately or combined.

The reeducation of lost motor functions.—Dr. Maurice Faure, of Paris, insists that any of the lost motor functions, due to the destruction of either a nerve center or of a nerve path, may be restored through the application of certain methods of training.

Doctor Frenkel, of Heiden, has certainly produced undoubted as well as the most surprising results by certain methods devised by

himself in the severest cases of locomotor ataxia. He certainly may be put down as the greatest authority on this subject, having elaborated his methods to greater perfection and refinement of detail than any other authority in the field. He has entirely restored completely lost functions of walking and of writing in the severest cases of ataxia.

Doctor Medea, of Milan, also speaks of a number of very favorable results that he obtained through the application of the approved methods of the reeducation of lost motor functions.

The origin of thermal spring waters and their mineralization.—Dr. Armand Gautier, of Paris, in a long and very scientific address, in which he explained his theory of the origin of thermal mineral springs and waters, is of the opinion that thermal mineral spring waters do not, as had been supposed, derive their water from surface waters due to rain and other sources, but are the products of igneous reactions, occurring at great depths, where also the lavas and the primitive rocks are found. The water originates at these great depths, where everything is at red heat, through the oxidation of free hydrogen gas. This water is gradually charged with mineral substances as it passes from these great depths upward toward the earth's surface.

Doctor Strauss, of Berlin, spoke of the present principles of the classification of mineral waters, which is dependent upon the numbers and kinds of disassociated "ions" which they contain, as an important advance in classification. It is assumed that a considerable number of dissociations is present in mineral waters of moderate concentration. In harmony with these new principles of classification we divide mineral waters into: (1) Alkaline springs—that is, such springs in the waters of which the H^2CO^3 ions prevail; (2) muriatic springs, in the waters of which the Cl' ions prevail, and (3) the bitter springs, in the waters of which the SO'' ions are most abundant.

It is owing to the application of this method of examination and analysis that it has been found that artificially made mineral waters do not and can not have the same effects as are possessed by natural spring waters. Moreover, since the radioactivity possessed by certain mineral waters can only be an induced quality on account of the sediments alone possessing the primarily radioactive matters, it is likewise easily understood why the native waters must be taken on the spot if they are to produce their characteristic effects, on account of their radioactivity becoming lost after three to four days, and why such waters when bottled for export are no longer quite the same that they were at their source.

Roentgenology.—Doctor Lassar, of Berlin, is of the opinion that the specific action of Roentgen rays can not as yet be finally accepted. This apparently elective and specific action may be due to the different degrees of general vital resistance possessed by different cells and tissues. Although abundant proof has accumulated of the great benefits produced by the rays, their physiological action needs further investigation, and the technique of their therapeutical application further elaboration and improvement.

Doctor Belot, of Paris, speaks in detail of the different parts of the apparatus used in administering the rays, especially of the chromoradiometer, which permits of an exact dosage and to the discovery of which is due an extension of the use of the method. At present it practically dominates the entire field of skin therapeutics. The effects of the rays on subcutaneous cancers are less constant, although a certain number of successes are claimed for them. Their effects on the hæmato-poietic organs, in the leukæmias in particular, are surprising. The general condition is rapidly improved and the normal blood formula is restored.

Doctor Maragliano, of Genoa, says that the rays should be made the favorite form of treatment of the leukæmias, and he believes that their correction is due to the destructive influence which the rays exert upon the abnormal leucocytes contained in the blood in these diseases. He likewise insists upon the Roentgenologist being a physician, thoroughly trained in the technique of the handling of the apparatus and the administration of the rays.

Kinesitherapy.—Doctor Hasebrock, of Hamburg, summarizes in a very clear and concise manner the effects of muscular exercise upon assimilation and dissimilation. Influencing as it does nutrition, it is bound to be of benefit both to the young and growing organism as well as to the convalescing one.

Doctor Cautru, of Paris, speaks of abdominal massage and its surprisingly good and rapid effects in cases of dyspepsia, chronic enteritis, diseases of the pancreas, kidney, and liver, and also with regard to the general muscular tonus of the whole alimentary canal. He warns against the too prolonged application of massage to these parts.

Absorption of mineral waters.—Doctor Cassiani, of Montecatini, states that the absorption of hypotonic waters from the intestine is greater than that of hypertonic waters. This is not alone a question of osmotic pressure, but one of the mineralization of the waters as well. Doctor Laqueur maintains that in spite of the fact having been frequently observed that both the cold and hot hydrotherapeutic

methods are followed by identical results upon blood pressure and leucocytosis, there still remain certain well-defined and distinct differences between them. He does not admit the absolute correctness of the assertion that there exists no difference in the reactions through hyperæmia produced by cold from those produced by heat.

It has been found that the so-called indifferent waters, of a temperature of 35° or 36° C., which produce, when prolonged to an hour or an hour and a half, an important improvement in renal circulation and an increase in the secretion of NaCl and nitrogen from the kidneys, that this effect is due to the radio-active properties discovered to be present in these mineral waters.

OCTOBER 16, 1907.

Radiotherapy.—Doctor Strebel, of München, sums up in a very interesting manner the present state of our knowledge with regard to radium. The inconstant element "radium," of the atomic valence of 225, is transformed, after passing through several different intermediate states, and under the production of heat and incandescent light, into helium, an inert but constant form of gas. During this retrogressive change of the destructive process in the radium atom a complex radiation occurs. This radiation is composed of α, β, and γ rays. The α rays are formed of small corpuscles of the size of 2 H atoms, and deviated by the magnet in the opposite sense like cathode rays; they are charged with + electricity and have a velocity of one-tenth that of light; they distinctly ionize the atmosphere, being strongly absorbed both by gases as well as solid bodies. The β rays are regarded as cathodic rays, composed of corpuscles of the size of one two-thousandths of an H atom. They possess a magnetic deviation opposed to that of the α rays, a velocity approaching that of light itself, and a permeability much greater than that of the X rays. The γ rays are real ether waves produced by the corpuscles γ, like the Roentgen rays. They are nondeviable, are not charged electrically, move with the greatest energy, and possess a permeating power greater than that of the Roentgen rays.

The emanations proceeding from radio-active bodies produce the rays of Becquerel. These rays are purely physical agencies, chemically inert, entering into every substance except glass. The rays of Becquerel produce luminescence, phosphorescence, fluorescence, chemical changes in substances under their influence, and sometimes real elementary transformations. The rays, after passing through solid substances, still affect the photographic plate.

One gram of radium produces from 80–98.5 calories of heat in one hour without notable loss in weight and at the same time sets free

an immense quantity of electrokinetic energy. Organic substances of plants and animals are disorganized by the rays of Becquerel, small animals are killed directly by them, and larger animals indirectly through their effects upon the central nervous system. Internal organs, as the spleen, the ovaries, testicles, are retarded in their growth, the skin becoming inflamed; certain pathological tissues are absorbed.

Therapeutically the β rays alone come into consideration. These may produce deep changes in the tissues when freed from their more aggressive partners through filtration.

Doctor Morton, of New York, gives an interesting summary of some of the clinical results obtained by radium in cases of lupus and cancer, and Dr. Deane Butcher, of London, speaks of the results obtained by him in lupus, phagendæmic cancers, epithelioma, eczema, and the subcutaneous infiltrations of unknown character. Further and similar observations are recorded by Dr. Edmund Freund, of Vienna, and Doctor Esdra, of Rome.

Phototherapy.—Doctor Schmidt, of Berlin, distinguishes very sharply between the effects produced by photothermic and photochemical rays. Photothermic rays are required when a strong transpiration is desired. Baths with incandescent electric light are the most agreeable form that can be used for this purpose. Sun baths include both forms of rays. The Finsen method is based exclusively on the effects of the photochemical rays (ultraviolet and blue-violet rays). The Finsen method gives by far the best results in cases of lupus. The Finsen-Reyn lamp is a convenient means of applying the rays.

Some interesting papers on the same subject were read by Doctors Hasselbrock and Jacobaeus, of Copenhagen, by Doctor Vermel, of Moscow, and Doctor Pellizzari, of Florence.

Doctor Amsen, of Wiesbaden, read a paper on massage and certain mechanico-therapeutical methods applied to the abdomen and their physiological effects, insisting, at the same time, upon the extreme delicacy of the object and upon the necessity that such treatment should be administered only by physicians. This was also emphasized by Doctor Serena, of Rome.

Toward the close of the work of the sections a rather long and elaborate discussion of the subject of climate took place. My notes on this topic show nothing that would be new or interesting to the service.

OBSERVATIONS ON VARIOUS SCHOOLS OF TROPICAL MEDICINE, LABORATORIES, HOSPITALS, AND DISEASES WHILE EN ROUTE FROM THE UNITED STATES TO THE PHILIPPINES VIA EUROPE.

By Passed Asst. Surg. A. W. BALCH, U. S. Navy.

Doctor Balch left this country on April 20, 1907, under orders for special duty in attendance upon the course of instruction at the London School of Tropical Medicine, and upon completion of this to visit Hamburg and Paris for the purpose of observing the methods of advanced laboratory work of the tropical schools and institutions of research at these places; thence proceeding by steamer to Cavite, P. I., stopping at Cairo, Egypt, and at Bombay, India, for the purpose of studying the diseases peculiar to those localities, especially to be seen in the English hospitals.

The spring session of the London School of Tropical Medicine started May 2, 1907, at which date I began attendance upon the courses of instruction. This institution was founded in 1899 by the Seamen's Hospital Society, and is located in the grounds of one of the hospitals of the society.

It is situated about 8 miles from London at the Royal Albert Dock. The location was selected because the great number of ships from foreign ports, particularly Africa, India, and China bring here many natives of those countries, and in the natives is found a constant source of supply of material in the nature of tropical diseases.

The natives, when ill, seriously object to leaving the vicinity of the docks, but are nearly always willing to enter the hospital connected with the school.

The laboratory is fitted for the accommodation of 40 students, who occupy two long tables running the entire length of the room. Two drawers and a small locker are at the disposal of each student. One side of the room is occupied entirely by large windows, which on bright days supply ample light for the microscopes on the table at this side. The second table in the middle of the room is fairly well supplied with light from these windows, but the constant interception of light by students and instructors passing in front of the table constitutes a great source of annoyance.

Tables and desks upon which microscopic work is done should almost necessarily be placed next to the windows to avoid such interference, and especially as there are many dark days in London and its vicinity. The microscopes supplied by the school are of English manufacture and an excellent arrangement for protecting them is in use here. Bell jars are suspended from the ceiling by a pulley and counterpoises are attached, so that the bell jars, used as covers for the microscopes, can be raised when not in use. This avoids much handling of the instruments and makes them always visible for inspection.

The tables are built entirely of wood, with the result that the tops are badly stained and in many places burned by contact with hot

coins used in heating staining fluids. Small sinks are provided on each table, but the supply of staining fluids, alcohol, oils, distilled water, and the like for the use of the class is placed on the middle table. This arrangement necessitates constant moving about the room, so that there is confusion and loss of time, and the small containers are frequently upset. It is far more practical to supply the more commonly used reagents for individual use and to provide some easily accessible place other than a working table for the less commonly used ones.

The school building is also provided with a small library and lecture room, which will accommodate about 60 people, and also a museum containing pathological specimens from cases of tropical diseases.

The hospital building is well equipped and has a capacity of 40 beds. Patients are mostly seamen from the ships entering the docks and are from every port in the world.

Lectures and clinics occupy from five to eight hours weekly, while the remainder of the time from 10 in the morning to 5 in the afternoon is spent at practical work in the laboratory. The school is closed Saturday and Sunday.

The laboratory course is in charge of Dr. C. W. Daniels, and occupies about five-sixths of the total time of the school. Each exercise is preceded by a short talk on the practical work to be done. The course begins with a few exercises on the morphology of the blood, method of making smears, fresh preparations, and staining. This part of the course is much like that given in the United States Naval Medical School, but it is less complete. More attention, however, is given to the examination of fresh blood films.

The method of making blood smears is most practical and gives excellent results. A small drop of blood is taken near one end of a slide, a second slide is then inclined over it, the edge in contact with the surface of the first slide. The second, or smearing slide, is brought in contact with the blood, which spreads, and is then pushed along, dragging the blood behind. By this means the smearing slide is never passed over the blood and distortion of the elements is obviated. The thickness of the film of blood depends upon the angle between the two slides—a greater angle making a thicker smear.

All the usual methods of blood staining are taught in the course and more attention is given to carbol thionin than is usual in courses of this kind.

Throughout the course, both in the laboratory and lectures, much time is given to the consideration of malaria. Development of the parasite is studied in preparations, both fresh and stained, made every few hours from cases of malaria. The sexual cycle occurring in the mosquito is demonstrated in permanent preparations belonging

to the laboratory. The lesions due to the presence of the parasite in the human body are well shown in numerous tissue preparations.

The various divisions of the group of protozoa, including the sarcodinia, mastigophora, sporozoa, and ciliata are studied in their relationship to the diseases of man and animals. In this connection may be mentioned amoebae, flagellates, ciliates, malaria, halteridium, piroplasma, hemogregarines, coccidia, spirochaeta, proteosoma, sarcosporidia, and trypanosomes. Tissues from cases of kala azar, blood from cases of relapsing fever, African tick fever, and human trypanosomiasis may be included. The methods of reproduction of the parasites, conveyance of infection, and, in many cases, clinical symptoms and methods of treatment are taught in the laboratory.

The various trematodes, nematodes, and cestodes are next considered. Classification, identification, reproduction, etc., are fully considered, and this part of the course is well illustrated by specimens, many of which are very rare. Among the specimens studied by the class may be mentioned: Blood from cases of filarial disease of several kinds; stools containing ova of opisthorchis, tænia saginata, hymenolepis, ascaris, oxyuris, schistosoma; urine containing schistosoma ova; sputum containing ova of paragonimus; tissues containing ova and adult parasites, and practically all the adult parasites of the great groups.

While many of these specimens are not at all commonly found, a systematic course of this kind, including some knowledge of all species, is of the greatest aid for a thorough understanding of the more common forms.

To the science of entomology is given more time than to any other subject taught. Beginning with the classification of insects, all the members of the subgroups which are important as carriers of disease or as pests are studied. Specimens of each variety of adult insects are shown and attention called to the characteristics. The collection covers practically all insects of importance, but many of the specimens are badly damaged and some are quite useless.

Instruction on the subject of mosquitoes is particularly good and complete. This includes determination of the variety, the habits of each, and methods of destroying the infection in a given locality. The classification of Theobold is followed in part only, for at this school it is not considered that a single damaged specimen is sufficient for the construction of a new species. A little time is given to the dissection of mosquitoes, but lack of material prevents much work of this kind.

Mention should be made here of the mosquito house. This consists of two small rooms with windows at one side, and is intended for use as a breeding place for the insects. It should provide a constant supply of larvæ, pupæ, and adults for laboratory purposes. Few adults

are obtained, however, and it is probable that either the rooms are not open enough to fresh air or that the air can not be kept sufficiently moist. A properly arranged room of this sort is essential for the study of mosquitoes.

The biting flies and ticks are considered in their capacity as carriers of trypanosomes, piroplasma, and spirochætæ. Each member of the class dissects one tick for the study of the important characteristics.

The course in bacteriology is most elementary, and consists of a few exercises which include the more important methods of staining bacteria and the chief cultural methods. It is considered that courses in bacteriology can be obtained elsewhere and that the greater part of the time of the school should be given to those diseases which are properly called "tropical" and to those due to animal parasites.

From the above it will be seen that much of the theoretical side of the subjects mentioned is given in the laboratory as rather informal talks preceding the practical exercises. Many, if not all, of these subjects are again taken up by the instructors in formal lectures, so that a fair estimate of the relative value of the two methods of instruction could be obtained from the opinions of the members of the class. Without exception all were of the opinion that those subjects which could be taught in connection with the practical work in the laboratory should be taught in that way. As an example of what is meant, the subject of sprue may be mentioned. Students will better understand a talk given on the diagnosis and treatment of this disease if given while actual specimens of the diseased tissue are being studied than when the same subject-matter is given in a formal lecture.

The various lecture courses are in charge of instructors who have had special experience in certain branches of tropical medicine. The scope of this work will be best shown by a list of the subjects considered in each course with such criticism as may be indicated. It will be understood that in each case etiology (when known), symptoms, differential diagnosis, treatment, etc., are given.

Course No. 1.—Dysentery, hill diarrhea, sprue, enteric fevor, heat stroke, scurvy, cholera, tropical liver, and abscess of the liver.

Course No. 2.—Pellagra, plague, ankylostomiasis, bilharziasis, leprosy, ergotism, lathyrism, and beri beri.

Course No. 3.—Malaria (5 lectures), black-water fever, yellow fever, and Malta fever.

Course No. 4.—Eye diseases: Eclipse blindness, night blindness, erythropsia, cataract, pinguecula, pterygium, ophthalmia; those resulting from other diseases, as malaria, cholera, beri beri, and yellow fever; those due to insects and parasites.

Course No. 5.—Diseases and bacteriology of the mouth: Rigg's disease, scurvy, stomatitis, neuralgia, odontalgia, caries, abscess, and conditions resulting from other diseases, as sprue, dysentery, etc.

Course No. 6.—Bacteriology and protozoology: Trypanosomes, proteosoma, piroplasma, dysentery organisms—bacteria and amœbæ, *B. typhosus*, *B. icteroides*, *S. cholera*, *B. pestis*, and the common fleas, *M. melitensis*, *B. tetani*, *S. maduræ*, *D. intracellularis*, and the *B. lepræ*.

Course No. 7.—Surgery: Applied anatomy of the abdominal viscera, diagnosis of liver abscess, hydrocele, chyluria, varicose glands, visceral abscess due to filaria, lymph scrotum, elephantiasis, splenic abscess, bilharsiasis, oriental sore, and tropical ulcer.

Mr. Cantlie shows by injection of the arteries, veins, and ducts of the liver that this organ consists of two nearly equal parts, the vessels of which do not anastomose. It is for this reason that liver abscess is usually limited to one half. He strongly condemns the open operation for liver abscess in most cases and recommends search with a needle, followed by insertion of a trocar and Manson's tube.

Liver abscesses are divided into suprahepatic, starting between the layers of the broad ligaments; intrahepatic, and subhepatic, the latter having no relation to dysentery.

The vena cava is always 4½ inches from the skin in any part of a line drawn around the body at the level of the liver when this line measures 32 inches. Puncture in any direction to a depth of 3¾ inches will avoid the vena cava. For each additional inch of circumference the depth of puncture may be increased one-fourth of an inch.

Course No. 8.—Diseases of the skin: This course is intended to cover those diseases of the skin peculiar to the Tropics, such as yaws, etc. Instead of limiting the scope of the lectures, however, an attempt is made to include in a few lectures a great number, many of which are found no more commonly in the Tropics than in any other latitude.

Course No. 9.—Helminthology: The subject-matter of this course is given properly in the laboratory.

Course No. 10.—Hygiene of the Tropics: The course begins with a consideration of tropical heat and rainfall, and these subjects are followed by practical lectures on personal hygiene, food, clothing, etc. The various methods of obtaining, storing, and purifying water and the diseases of reservoirs are explained.

A considerable part of the time is devoted to the disposal of sewage. Methods of calculating the amount are given, and the various processes as pail system, shallow and deep trenching, Shone system, sewag[illegible] septic tank, contact-bed system, Scott Moncrieff system, and p[illegible] system are taught.

House construction is considered an important subject in the Tropics; the plan of town and land drainage, character of the soil, and foundations for buildings, roof and house angles, character of building materials, double roofs, and ceilings are the special points taken up.

While this course is intended to apply especially to the towns of India, it applies equally well to the construction of camps for military purposes.

The clinics depend upon the material which happens to come to the hospital, and necessarily varies greatly during different periods. The important cases of tropical diseases upon which clinics were held during this session of the school were as follows: Malaria, sprue, beriberi, trypanosomiasis, filariasis (diurna), chyluria, hepatic abscess, elephantiasis, dysentery, ankylostomiasis, black-water fever, and a case of filaria medinensis. The supply of clinical material is limited, but is perhaps as abundant as could be found elsewhere at a distance from a tropical country.

The School of Tropical Medicine, in Hamburg, Germany, is, in its general arrangement, much like that of London. The courses in bacteriology are far more extensive and are nearly identical with those given in the United States Naval Medical School. This school is, however, much better supplied with such material as mosquitoes, flies, and enterozoa of various kinds. As an example of this, the students are all given specimens of several species of glossina, culicina, and anophelina. It must be obvious that such opportunity for study is far better than that afforded by the mere glance at a single specimen shown to an entire class.

In this school a room about 20 by 10 feet in size is kept at 37° C., and is used as an incubator for bacteria, as well as a breeding place for mosquitoes. In it are also cages for various tropical snakes and other small animals. Stegomyia breed well here in cages. The air is kept well moistened by constant evaporation of water by suitable heating apparatus.

The abundance of material is due to the fact that officers of the army, naval, and consular service on foreign stations are required by the Government to collect whatever material is available for use in the school.

The Institut für Experimentelle Therapie, in Frankfort, is devoted mainly to research work. There is, however, some clinical laboratory work done here, and in this connection the method for testing the blood for the Widal or typhoid fever reaction is noteworthy. The reaction in every case is carried out with both the typhoid and paratyphoid organisms. Cultures sterilized at 60° C. are used, as they are practically permanent and the labor of constantly making fresh

cultures is avoided. Blood is drawn into a small U tube and centrifuged.

In each of five test tubes is placed 1 c. c. of sterilized typhoid emulsion, and in five other similar tubes 1 c. c. of sterilized paratyphoid emulsion. Two-tenths c. c. (0.2 c. c.) of serum is diluted to 2 c. c. with normal salt solution, giving a dilution of 1–10. One c. c. of this solution is now added to a tube containing 1 c. c. of typhoid emulsion, giving a dilution of 1–20.

Again, 1 c. c. of 1–20 is added to a tube of the emulsion, giving a dilution of 1–40. Continue until five dilutions have been made, the last being 1–320. The remaining 1 c. c. of 1–10 dilution is added to the first tube, containing 1 c. c. of paratyphoid emulsion and further dilutions made as in the case of typhoid. Greater dilutions can be made if considered desirable. The contents of each tube is now transferred to a properly labeled bacteriological watch glass, the surface of which is ground, so that when the glasses are superimposed air-tight chambers are formed. The watch glasses, with their contents, are now placed in a thermostat at 50° C. for two hours, after which time the contents can be examined either microscopically or macroscopically for agglutination. In practice the preparation of the dilutions requires very little time, and the method is most accurate in its results.

A new trypanosome stain is in use here. Preparations are stained ten minutes with a water solution of eosin, followed by ten seconds with borax-methylene blue. The results are superior to those obtained by the Leishman group of stains.

Very extensive research upon the subject of trypanosomes is being carried out here. All varieties of trypanosomes are carried as an infection in white mice, a matter of interest, as it is frequently stated that but few varieties are infectious for these animals. The effects of various drugs, as atoxyl and its derivatives, trypan red, trypan blue, methylene red, etc., upon these protosoa are being studied, and it has been definitely determined that the trypanosomes after a time acquire an immunity toward each of these substances. The value of this work in the treatment of human trypanosomiasis is very great, for it has been shown as a result that a given drug soon loses its effect and must be replaced by another.

Professor Neisser kindly demonstrated his stain for diphtheria, and the results are quite different from those obtained in the United States. Instead of the minute bluish granules which we see in the bacilli stained by this method, Professor Neisser obtains a picture in which the ends of the bacilli are stained blue. He regards the stain as absolutely diagnostic, while in the United States the method is usually regarded as only of value as confirmative evidence of identity.

The stains are from the same manufacturer, and his formulæ are the same as those in use in America. The discrepancy should be investigated, for this method is more rapid and diphtheria bacilli in a mass of other organisms can be detected more easily than by any other method.

As a matter of interest may be mentioned the fact that carcinomata from mice, after being frozen for two years, have been able to produce the disease in other mice.

Unfortunately the Pasteur Institute in Paris was closed during the period of the visit, and it was difficult to even obtain admission to the buildings.

The institute is devoted to research work and to the production of serums and vaccines. Much of the work is similar to that being done in Ehrlich's Institute, in Frankfort; trypanosomes are being studied in the same way and extensive research in carcinoma is being carried on. Treponema pallidum is being studied in the lesions produced by inoculation of anthropoid apes, and the reason for the sterility of the intestinal contents of certain bats is being sought.

The Kasr el-Ainy Hospital, in Cairo, offers an excellent opportunity for study of the more important Egyptian diseases, ankylostomiasis, bilharziasis, and trachoma.

Bilharziasis, while very widely distributed in the world, gives rise to far more extensive lesions in Egypt than elsewhere, and the worms are found at about 40 per cent of the autopsies. The museum contains many very fine pathological specimens, showing the lesions in the bladder, rectum, urethra, vagina, liver, etc.

In the wards of the hospital are always to be found cases of the disease. These show many different forms of infection, varying from great cauliflower anal or vaginal papillomata, resembling epithelioma, to the milder bladder infections, which so often result in the formation of a calculus.

The effort to determine the method of entry of the parasites into the body has been continued for many years, but as yet nothing definite is known. Professor Looss is of the opinion that the miracidium may enter the skin and that infection occurs in this way.

This disease is known to be not uncommon in the West Indian Islands, and a few cases have been reported in the United States.

Ankylostomiasis, like bilharziasis, is widely distributed; but here again Egypt seems to suffer most severely from the infection. The worms are found at 20 per cent to 30 per cent of the autopsies, and in lower Egypt 14 per cent of the army recruits are found to be infected. Twenty-eight per cent of the cases show less than 3,000,000 corpuscles per cubic millimeter, and in some the anemia and resultant weakness are so extreme that the patients are unable to leave their beds. Over 2,000 worms have been found at autopsy in a single case.

The treatment varies greatly in different places. Three years ago at Port Said all cases entering the Egyptian hospital were given three 1-gram doses of thymol following purgation. At present thymol is given less freely, and both here and in Cairo preference is given to a mixture containing oil of eucalyptus, chloroform, and castor oil, although thymol is still used. At Bilibid, in Manila, 6 grams of thymol are given in a single day and the treatment repeated at intervals of two or three days until the worms are expelled. From all that can be learned in various places, it would seem that no danger from thymol administration need be feared if the patient can be kept under perfect control and fats and alcohol wholly eliminated during the period of treatment. Thymol should not be used, however, in old people or in cases where organic heart disease is present. Sandwith considers that the best results are obtained from male fern followed by beta-naphthol. It would seem that the fear of thymol in the United States is to a great extent unfounded.

Many cases of trachoma are always to be found in the Egyptian hospitals, and while the cases are not different from those which occur elsewhere the abundance of material makes this an excellent place for the study of the disease.

A few cases of pellagra are to be seen at the Kasr el-Ainy Hospital, but they are more numerous at the hospital for the insane in Cairo. Sandwith has determined that the disease is the result of eating bread made from maize which has been infected by a fungus, *aspergillus fumigatus*. Healthy maize can not cause the disease, but poverty, overwork, insanitation, etc., are important in its production. The skin lesions closely resemble icthyosis, but they appear only on those parts exposed to the direct action of the sun, and are, therefore, mostly symmetrical. Digestive disturbances are followed by cerebral and spinal symptoms, alteration in the patella reflex, and finally amentia and dementia. The disease is known in Mexico, and imported cases have been seen in the United States. It is conceivable that these cases might become fairly common among the poor classes of America in districts where much cornbread is eaten if the corn is not properly dried before being stored.

An interesting group of cases is now being studied in the Cairo hospitals. The only pathological condition is an enlargement of the liver, and no cause as yet has been found. The disease is most commonly found in children and is frequently fatal.

At Bombay, India, all the hospitals were visited, but only the plague and cholera hospitals are of sufficient special interest to be included in this report. Through the courtesy of Doctor Liston the greater part of the time was spent in the Government laboratory.

The plague and cholera hospitals are rough, open, one-story structures, which serve merely as a protection from rain. Cases of relapsing fever are received at the cholera hospital and one case of smallpox was seen here. Plague cases are characterized by the marked appearance of intoxication and extreme prostration. Often the point of entrance of infection can be found. Floors in the hospitals are occasionally wet with kerosene or crude carbolic acid as a protection against fleas, but aside from this no special means are used to prevent spread of the disease to attendants. No cases of pneumonic form were to be seen during the visit, but there were numerous cases of both bubonic and septicemic forms.

Doctor Choksy, of the Maratha Plague Hospital, considers that the ideal treatment of plague is by use of the Yersin Roux serum subcutaneously and 10 to 20 minims of 1–1,000 adrenalin chloride solution every two or three hours internally. He has found also that cyanide of mercury, in doses of one-tenth grain every two or three hours in cholera cases, has a marked influence in controlling the evacuations, which soon lose their "rice-water" character. A marked stomatitis may be induced, however, if many doses are required.

The manner of transference of plague to man has for many years been under investigation, and has just recently been finally settled by the plague commission in Bombay. A series of experiments, of which the following are a brief summary, would seem to decide the question: Fleas collected from rats are proved to be infected, during certain seasons, to a considerable extent with plague bacilli. This is shown by cultural methods and by allowing the fleas to bite guinea pigs, the latter being highly susceptible.

If normal guinea pigs, carefully freed from fleas, are suspended in cages a few inches above the ground, or if the cages be surrounded by adhesive fly paper, the animals remain free from fleas and from infection, even though infected fleas be present in the room. Other guinea pigs, not protected by either of the above methods, become infested with fleas, and many are infected with plague bacilli.

The most common rat flea, *pulex cheopis*, will also bite man, and protection against fleas seems to give immunity to plague.

The Parsee custom of exposing the dead to destruction by vultures on the "tower of silence" must result in widespread scattering of plague bacilli through the excreta of these birds. It is not considered, however, that this is a matter of importance in spreading the actual disease.

The entire city of Bombay is patrolled by inspectors, whose sole duty is the collection of rats, dead or alive. These rats are carried

at once to the laboratory, where each is examined for the presence of disease and the number of fleas on each counted. The beginning of an epidemic of plague in man can safely be predicted when an increase in the number of rats dead of the disease occurs.

Haffkine's prophylactic is now being used to an enormous extent in India. This vaccine is prepared at the laboratory in Bombay largely by expert native labor. Owing to religious prejudices of the various sects in India neither beef nor pork can be used in preparing culture media, and goat meat has been selected for this purpose. The meat is peptonized by action of hydrochloric acid; the latter is then neutralized by soda, giving the necessary amount of sodium chloride, and the resulting clear broth is ready, when sterilized, for use as a culture medium. Cultures are prepared in large flasks, and the contents of each tested to determine its purity. The organisms are then killed by heat and the sterile emulsion is transferred to small flasks, which have an elongated neck about 3 millimeters in diameter and are sealed in a flame. A small amount of the emulsion is then shaken into the neck of the flask and a blowpipe flame applied in such a manner that the neck of the flask is separated from the body without exposing the contents of either to the air. By this means a small sample of each flask of vaccine can be retained for examination.

Daboia and cobra venoms are collected here for use in preparation of antitoxin. Several hundred of the serpents are kept in small cages in one of the rooms of the laboratory. The native attendant grasps one of the animals about the neck, holding the tail between the great and second toes. The mouth is forced open, the fangs hooked over the edge of a wine glass, and a little pressure on the fangs allows the venom to be ejected as a clear gelatinous fluid. This is dried in a vacuum and preserved for use in immunization of animals for the production of antivenin.

The laboratory possesses an excellent collection, including many varieties of fleas and Indian mosquitoes.

At Hongkong all the hospitals were visited, but little of special interest was learned. In the Matilda Hospital an excellent plan for keeping bedding is in use. A small room is provided for the purpose, and in it a large oil lamp is kept burning. By this means mattresses, pillows, and linen are kept perfectly dry and free from mold. Beds are only made up when required for use.

In about 50 per cent of all cases received at the morgue in Hongkong opisthorchis infection of the liver is found. The liver is incised and the parasites can then be pressed out with the fluids of the organ. The infection gives no apparent symptoms during life.

At all the institutions visited every effort is being made to make instruction as practical as possible. Didactic lectures are few in number and nearly the entire periods of instruction are given to clinics, laboratory, etc. In those schools where tropical medicine is taught the pathological museum is constantly utilized, and students are required to become familiar with the parasites concerned and the microscopic lesions produced in the tissues. Instruction of this kind requires that the supply of material should be abundant and varied: that an appropriate animal house be provided, and that courses of instruction be of sufficient length to allow extended practical work.

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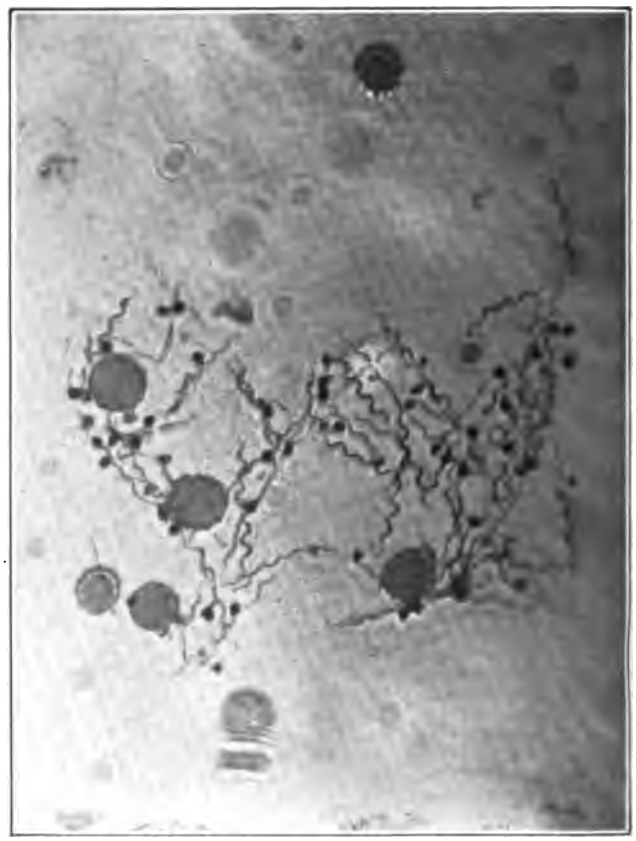


FIG. 1.—MICRO-PHOTOGRAPH SHOWING A GROUP OF SPIROCHÆTES WITH ENLARGEMENTS.

SPECIAL ARTICLES.

A PECULIAR CHARACTERISTIC OF SPIROCHÆTA DUTTONI.

By Passed Asst. Surg. C. S. BUTLER, U. S. Navy.

While engaged in trying to determine the length of time that the spirochætes of African tick fever could be kept alive outside the body, and still be capable of infecting nonimmune rats, certain peculiar bodies were noticed to develop pretty constantly upon these organisms and these we desire briefly to describe. The organisms for study were procured by carefully chloroforming the rat while at the height of the disease (with the strain of spirochætes we have, usually about the sixth to eighth day) and taking the heart's blood aseptically with a hypodermatic syringe. This was placed in 0.8 per cent salt solution to which was added 1 per cent of sodium citrate. This mixture was kept in the ice box, sealed to prevent evaporation, and at a temperature of about 15° C. Under these conditions, there develops on the bodies of the spirochætes, with few exceptions, small nodules generally about the midportion of the organisms, but occasionally toward one end, enlargements which vary in size from one to three microns. These bodies are so small that it is difficult to determine their staining reactions, but in many of them there were one or more granules which undoubtedly took the chromatin stain in Romanowsky's method. Occasionally outside the granules, the enlargement shows an area of light blue staining. In others this knob-like enlargement is so deeply stained that the small red chromatin dots can not be differentiated. In some spirochætes this enlargement seems to have grown out from the side of the organism, being attached by a thin process; in others it is situated in the direct line of the spirochæte as if the organism had simply enlarged at this point. The parts of the spirochæte extending on either side of these knobs appear to degenerate, staining more and more faintly the longer the mixture is kept. The enlargements seem to lose none of the staining qualities in keeping one month. In many cases after several days only the knobs could be stained. In others, fragments of the spirochætes could be made out still attached. This was after the mixture of blood and citrate solution had remained in the ice box from fifteen to thirty days.

These bodies are not present on the spirochætes in specimens which are stained immediately after the films are made, indicating that they do not occur in the peripheral blood. Their resemblance to minute blood platelets would, however, make it impossible to identify them in case they were detached from the spirochæte and floating free in the blood stream. They form under certain circumstances very rapidly when the blood is drawn. From a number of flies which had eaten the blood of a spirillosed rat these bodies were stained on the intact spirochaetes gotten from the alimentary content within two hours of the time of ingestion. There can be no question that they are a part of the spirochæte, as, on a number of occasions when the citrated blood was examined in the hanging drop on the day after the rat was killed, spirochætes moving sluggishly and dragging these nodules have been seen. At first it was thought that these bodies were blood platelets, or parts of them, entangled by the organisms and carried along with them, but the law of chance precludes this conclusion, as it would be an impossible thing for each spirochæte to entangle just one blood platelet, and that usually about its middle third. Nor is it, for the same and for the further reason that in the hanging drop it appears as a distinctly refractile body, an artifact produced by the looping of the spirochæte.

The nodule is organically a part of the spirochæte under the conditions described, and, in our opinion, is the appearance referred to by Dutton and Todd (Lancet, Nov. 30, 1907, p. 1524) as occurring in infected animals. To quote, "Spirochæte frequently occur which possess either median or terminal knob-like swellings." In the sodium citrate salt solution, instead of being a "frequent" occurrence, practically every spirochæte develops this appearance. Nodules having a similar appearance to what we describe have been mentioned as occurring in the bodies of infected ticks.[a] In the last edition of Christopher and Stephens similar bodies are pictured.[b] An effort was made by Mink to identify these bodies in the liver, spleen, and other organs of rats killed during the interval between the time of appearance of spirochætes in the superficial circulation. It was thought that this body might represent the resting stage present in the liver and spleen during the interval. Very thin sections of these and other organs were made and stained by Romanowsky's and Levadeti's methods. Bodies were occasionally seen in sections of liver and spleen which had very much the appearance of these knobs still attached to the spiral body. This was noticed in preparations stained by both methods. When detached from the

[a] Carter: On Presence of Spirochæta duttoni in the ova of Ornithodorus moubata. Annals of Tropical Medicine and Parasitology, vol. 1, No. 1, p. 157.

[b] Practical Study of Malaria and Blood Parasites. 3d ed., Pl. V, fig. 4.

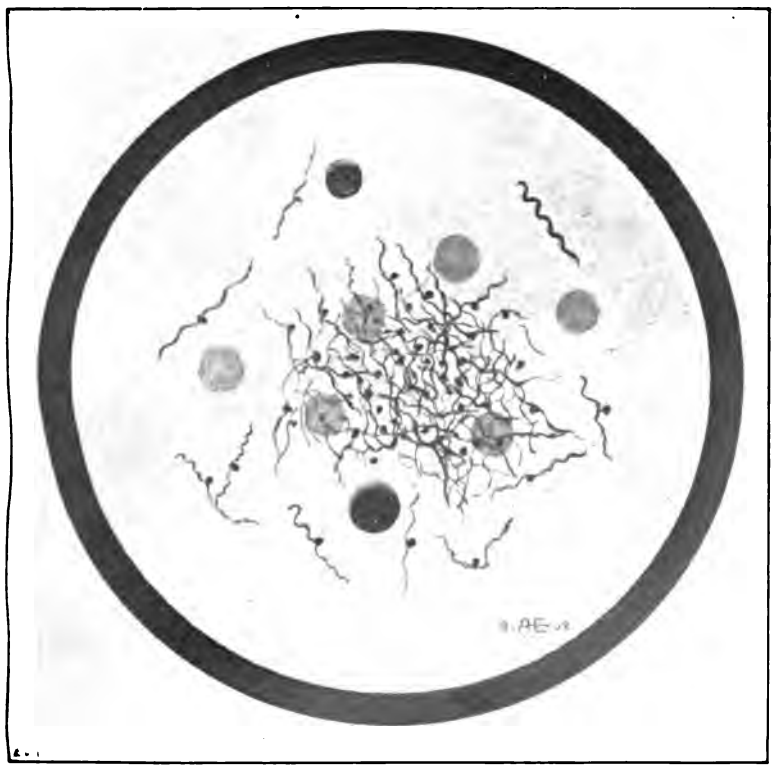


FIG. 2.—DRAWING TO SHOW A COLLECTION OF SPIROCHÆTES WITH ENLARGEMENTS.

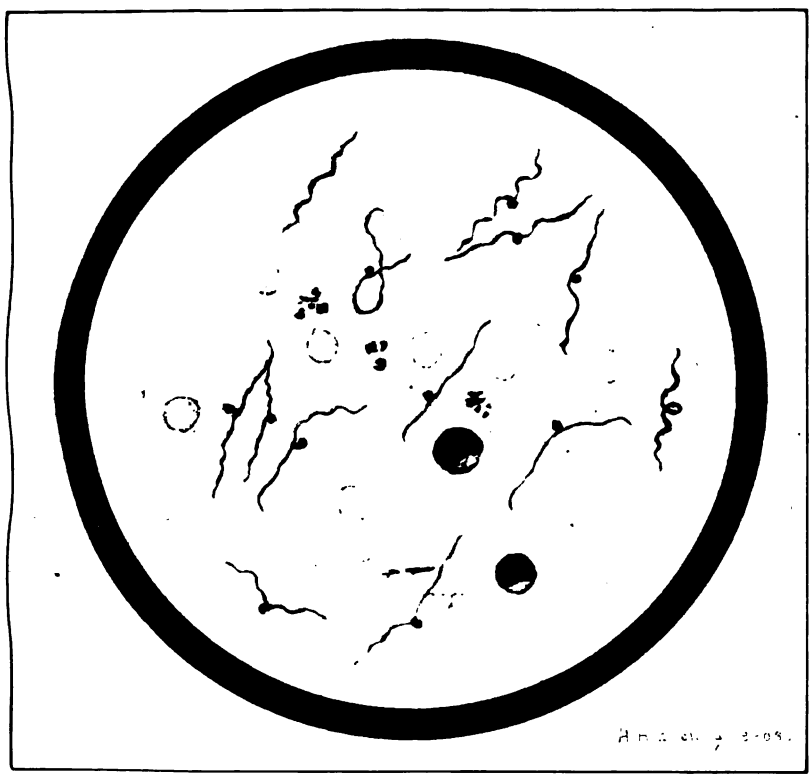


FIG. 3.—DRAWING TO SHOW BANDING AND ENLARGEMENTS.

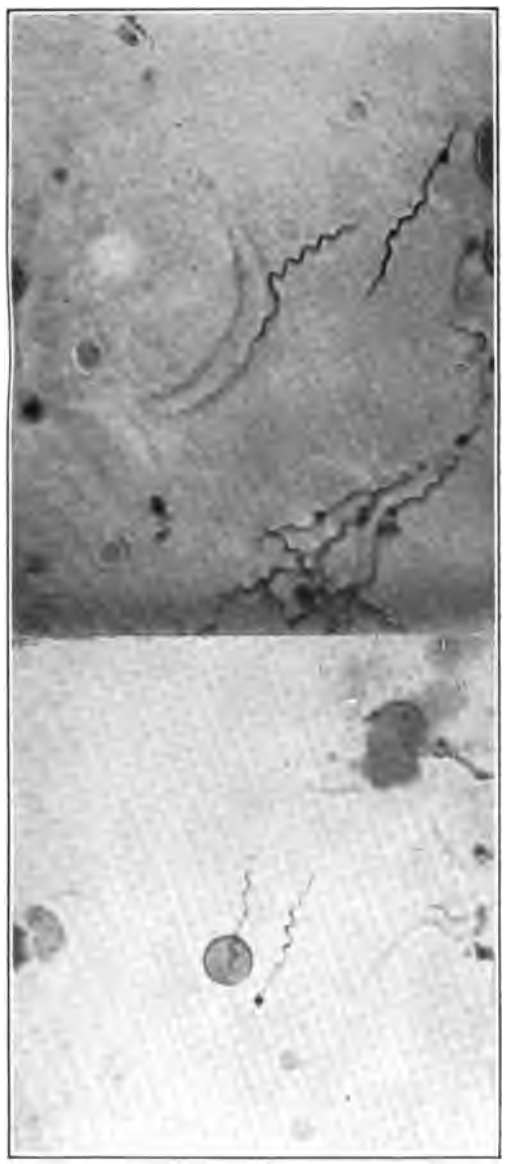


FIG. 4.—MICRO-PHOTOGRAPH SHOWING ONE SPIROCHÆTE WITH AN ENLARGEMENT NEAR ONE END; ANOTHER HAS TWO ENLARGEMENTS.

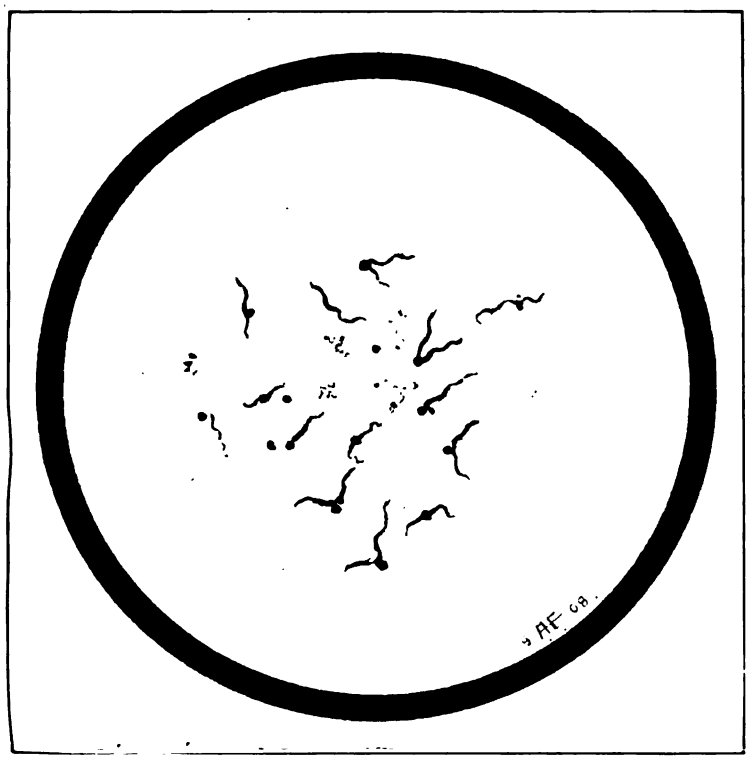


FIG. 5.—DRAWING TO SHOW DEGENERATING SPIROCHÆTES.

spiral, however, it is absolutely impossible, on account of their minuteness, to differentiate them from artifacts or blood platelets. For the same reason it would be difficult to identify them in case they occurred in the blood during the interval. One of our experiments would seem to indicate that either they do not occur in the blood during the interval, or if they do occur they will not infect non-immunes. A rat's blood (No. 1) which had shown no spirochætes for two weeks was injected into another rat (No. 2). Number 1 was then killed and an emulsion in salt solution made from the liver and spleen. This was injected into rat No. 3. After one week rat No. 2 showed no spirochætes, while rat No. 3 was heavily infected. Our reason for writing of the bodies is because they seem constantly to appear soon after infected blood is subjected to the conditions described. After their appearance the mixture is still infective for many hours. (The longest time at 15° C. after which we successfully inoculated it was four days.) The fact that they retain their staining qualities for a much longer time than the spiral portion of the organism would seem to indicate that they have to do with the perpetuation of the life of the spirochæte. We have at the present time a mixture of blood and citrated salt solution which is one hundred days old. The swellings upon the spirochætes have apparently lost little if any of their staining qualities, though the spiral portions have in many cases entirely disappeared and the mixture long since ceased to be infective.

If these bodies really show cromatin dots, and it certainly seems that they do, the spirochæte must be a protozoon and not a bacterium. The body is clearly not a spore. Bacteria, if they have chromatin in the meaning which we accept for protozoa, do not show the arrangement of it in definite dots as is the case with the protozoa. The chromatin in the bacterium is distributed throughout the body of the organism and is not defined by staining methods. In the protozoa it is particulate and usually well defined. At present the status of spirochætæ is not well understood. Are they bacteria, or are they protozoa? On the one side of this question we have the careful work of Novy and Knapp; on the other that of Schaudinn. It is by no means our purpose to try to decide this question, but we hope that the determination of what these bodies are and what the chromatin-like substance they contain may be will lend itself to a determination of the position of this class of organisms.

The work we have done has been with Spirochæta duttoni which came from the Army Medical School, Washington, D. C. At present we are trying to determine if the same appearances are produced with the Spirochæta obermaieri under similar conditions.

REPORT OF THE INVESTIGATION OF SAMOAN CONJUNCTIVITIS.

By Passed Asst. Surg. P. S. Rossiter, U. S. Navy.

Several writers upon the Samoan Islands have remarked the prevalence of gonorrheal conjunctivitis and the large number of the population having corneal opacities caused thereby. I also was impressed soon after my arrival by the large number of cases of purulent conjunctivitis of a severe grade and the large percentage of the population showing corneal opacities, which they stated followed an attack of such conjunctivitis. It seemed unusual to me that in a community where gonorrhea of the genito-urinary tract was quite rare, gonorrheal conjunctivitis should be so prevalent. I therefore undertook a careful study of those cases presenting themselves for treatment (105 in four months), from which I draw the following conclusions:

That the type of conjunctivitis so prevalent in Samoa, and which, in lieu of a better designation, I will call "Samoan conjunctivitis," is a distinct, acute, infectious disease, characterized by rapid onset, severe pain, photophobia, a high grade of conjunctival inflammation (soon becoming purulent), a tendency to corneal destruction over greater or less areas; and the presence in the discharge, often in pure culture, of its etiological factor, a distinct micrococcus described below.

Geographical distribution and history.—From the best information obtainable, a type of conjunctivitis with the same clinical features is prevalent, but to a less degree, in Niue, Roratoga, New Guinea, and other island groups of the South Pacific. It is prevalent throughout the entire Samoan group. Little can be learned of its history. It appears to have been endemic as long as the natives can recall, but to have become much more prevalent since an epidemic of Morbilli, which visited Samoa in 1893. The Samoans use two names for the disease—"M'ai Mata," meaning sick eyes, and "Pui Mata," which means contagious eyes.

Etiology.—In all the cases examined microscopically, a micrococcus described below was found. In all but two of these cases, examined before the third day, the organism was obtained in pure culture from the conjunctiva and from the sticky, mucoid discharge. In the cases where a mixed infection was found, the special organism was found in connection with the pneumococcus, or staphylococcus pyogenes aureus, or both. In no case examined, not suffering from the disease within two months, was the specific organism found. The disease is widely prevalent in Samoa, and is probably transmitted from eye to eye and from person to person by the hands, by flies, and by dust. Several individuals in the same household will usually be found with the disease within a short period. In two cases, in which the organism was found in pure culture, the disease was transmitted from father to son. This type of conjunctivitis may occur at any age, but

is rare under six months and in the aged. Both sexes are equally affected. Allowing for more cleanly surroundings and habits, whites seem to be as readily infected as the natives, and the course of the disease to be the same.

Symptoms.—The exact period of incubation is undetermined, but appears to be about eighteen to thirty-six hours. Usually both eyes are affected at the same time, but often the disease appears first in one eye, the other becoming involved twelve to twenty-four hours later. The onset is with a slight roughness of the conjunctiva, slight burning sensation, mild photophobia, and a little watery discharge from the eyes. The degree of inflammation increases rapidly and within a few hours a severe form of conjunctivitis exists, in which the entire conjunctiva is deeply injected. Small hemorrhages and spots of ecchymosis may be present, and there is marked photophobia and severe burning pain over the infected area, with dull intraocular pain as well. The discharge becomes sticky and muco-purulent, the lids are glued together, and often swollen and edematous. Corneal complications are very common—at first simply as cloudy infiltration, in which stage it is usually arrested by proper treatment; but in improperly treated and neglected cases, going on to ulceration and at times staphyloma and iritis. Constitutional symptoms do not appear in the milder cases. In the severer forms headache and a rise of temperature to 100° or 101° F. may be present.

Diagnosis.—The actual diagnosis must be made in the laboratory. Clinically all the cases of acute, purulent conjunctivitis, which I have seen in Samoa, have been of this one type; but it might be confounded with most of the usual types of acute conjunctivitis (all of which, however, are rare in Samoa) or with conjunctivitis neonatorum, which, on account of the rarity of gonorrhea of the genitalia, is necessarily rare. Within five months I have had brought to me for treatment 157 cases of conjunctivitis, 155 of which were of the type under consideration, the two remaining cases being traumatic in origin.

Prognosis.—In early cases the prognosis is good. Where proper treatment is instituted within forty-eight hours, complete recovery usually results. Where corneal ulceration has taken place the prognosis depends upon the location and extent of the ulcer. The ravages of this disease in improperly treated or neglected cases are only too evident in the enormous proportion of the population of Samoa who have lost, either in whole or in part, the use of one or both eyes from corneal opacities.

Treatment.—The various salts of silver present the best method of treatment. When the first sensations of burning and roughening are felt, one or two instillations of a 5 per cent solution of protargol will usually abort the disease. Later and before corneal ulceration has taken place, instillations of 5 per cent solution of protargol, two to four times daily, will usually effect a cure in five to seven days.

After observing 155 cases it is my custom at present to treat the mild cases presenting early, by instillations of 5 per cent solution of protargol twice daily and protection from the light by shades, goggles, etc. In later and severer cases, the patient is given a laxative, placed in bed in a darkened room, compresses wrung out in iced boric acid solution over the eyes, and 5 per cent solution of protargol instilled three to five times daily. This method of treatment usually results in a complete cure within five to seven days; the characteristic micrococci disappearing after two to three days. When corneal complications make their appearance, hot compresses are substituted for cold, and atropine sulphate three-fourths per cent solution instilled once daily. Corneal ulcerations are treated by the usual methods. Some cases show a tendency to recur in a subacute form for several months, probably on account of the incomplete eradication of the micrococcus; but one attack which has completely disappeared, seems to confer a certain amount of immunity. Nitrate of silver solution, 1 to 2 per cent, has been used with good results, but equally good results have been obtained with 5 per cent protargol, and with less pain and discomfort to the patient. The natives have been in the habit of using the juices of various plants squeezed into the eyes in these cases, probably on account of their slight astringent properties. All cases which I have seen, in which this method was employed, had been greatly aggravated thereby. In recent cases of corneal opacity resulting from this disease, good results have been obtained by massage with the finger on the lid, after the introduction of yellow oxide of mercury ointment, combined with the instillation of adrenalin chloride one-one thousandth solution twice daily, and the internal administration of moderate doses of potassium iodide.

MICROCOCCUS OF SAMOAN CONJUNCTIVITIS.

Small micrococcus about 0.6μ to 0.8μ in diameter, often seen as diplococci, and when so seen markedly resembling gonococci, the adjacent margins often being flattened; stains readily with the usual stains; is decolorized by Gram's method (control *Staphylococcus P. A.*); takes methyl violet to nearly black; grows readily on usual artificial culture media, as follows:

Agar plates: Colonies appear in eighteen to twenty-four hours as small, raised, opaque, moist, rounded disks, with undulate margins.

Agar streak: Abundant, raised, white, opaque, moist growth.

Bouillon: Uniform turbidity; fine granular precipitate after three days.

Potato: Abundant, raised, white, opaque, moist growth.

Milk: Grows readily; not coagulated after six days; no acid formation to litmus milk.

Fermentation: No gas production in bouillon fermentation tubes.

Gelatine: Grows readily in gelatine media, but data as to stab and plate cultures was not obtainable, owing to high room temperature and lack of cold incubator. This organism will retain its vitality on any of the above-mentioned media for months if moisture is supplied. Grows equally as well at room temperature, which, however, is high, 85°–95° F., as at body temperature.

Pathogenesis: Found in all cases examined of Samoan conjunctivitis; not found in healthy eyes.

Although the cultural characteristics of the above-mentioned organism have not been obtained for all media on account of climatic and other conditions; yet it is believed that sufficient data have been obtained as to its cultural and staining properties to warrant the assumption that it is probably the *M. catarrhalis*, and that it is the sole cause of the type of conjunctivitis so prevalent in Samoa.

THE COMPOSITION OF POTABLE WATER.

By Pharmacist E. R. Noyes, U. S. Navy.

Owing to the prevailing idea that it is possible to give a composite standard which will illustrate the average quantity of the various ingredients which a potable water may contain, it has frequently occurred to me that a discussion relative to the plausibility of such a picture, even if not of much value, would at least be of interest.

In the discussion of this subject the total solids, the free and albuminoid ammonias, the nitrites, nitrates, chlorine and oxygen consuming power only will be considered as these are the ingredients which determine potability. While the color, odor, turbidity and sediment enter as factors of quality, it is more from the æsthetic standpoint than from their true relation to purity.

It would perhaps be advisable to explain here the meaning of the terms pollution and potability, or purity, as used in this article.

The term pollution is intended to convey the idea that there is evidence that animal products, such as urine, the soluble portions of feces, etc., have at some time, either recent or remote, entered the water. It does not indicate that the water is actually productive of disease, but that danger of such a mishap is ever present.

The terms purity and potability are used synonymously and indicate, not that the water is free from dissolved substances, for the well-known saline waters may be pure in the sanitary sense, but that there is no evidence of the addition at any time of animal products. As long as the water maintains its original composition it can be used without risk.

The subject under discussion is one of great breadth, and it is not claimed that that which follows is a complete exposition of it, but

merely an outline which it is hoped will be sufficient to place the matter before the reader in the proper light.

In the numerous works which deal with the subject of water examination and analysis figures are quite generally given which indicate either the average analysis of a large number of waters, both pure and impure, or the largest quantity of the different ingredients found in waters known to be pure; or again it may express the quantity of a substance which a pure water might reasonably be expected to contain or it is the largest quantity which an authority deems safe, not that the substance itself is deleterious, but because an amount in excess of that given would in all probability indicate pollution.

As it will be necessary in this discussion to have access to a number of these figures, for convenience the following table has been compiled. The figures express the parts per million and are those of recognized authorities. For brevity these authorities are designated by capital letters, while (a) indicates that the figure is the average obtained from a large number of analyses, (b) the maximum found in waters known to be pure, and (c) what the authority considers the permissible limit. In some cases the authority does not state whether it is surface or ground water to which he refers, consequently the same figure appears under both varieties. Owing to the great variation in the depth of wells, a condition which greatly influences the mineral content of water, the figures for deep-well water are incomplete and hardly representative. The figures given for rain water are also unsatisfactory, as the locality and time of collection yield waters which differ widely in composition.

	Authority.	Surface water.	Ground water.	Deep-well water.	Rain water
Total solids	A	97 (a)	282 (a)	432 (a)	[illegible]
	B	200 (a)	.....	.....	.....
	C	.....	575 (c)	.....	.....
	D	.....	500 (a)	.....	.....
Free ammonia	B	0.01–0.12	0.01–0.12	.....	[illegible]
	D	0.05 (c)	0.05 (c)	.....	.....
	E	.....	.....	0.80 (b)	.....
Albuminoid ammonia	B	0.10–0.28	0.10–0.28	.....	[illegible]
	C	0.10 (c)	0.10 (c)	.....	[illegible]
	D	0.15 (c)	0.15 (c)	.....	[illegible]
	E	.....	.....	0.07 (b)	.....
Nitrite (nitrogen as)	B	0.003 (a)	0.003 (a)	.....	.....
	D	None (c).	None (c).	.....	.....
	F	0.0135 (a)	0.0135 (a)	.....	.....
	G	Traces (a).	Traces (a).	Traces (a)	.....
Nitrate (nitrogen as)	A	0.09 (a)	3.83 (a)	4.95 (a)	.....
	B	3.90 (a)	.....	.....	.....
	H	1.04 (c)	1.04 (c)	.....	[illegible]
	I	2.60 (c)	2.60 (c)	.....	.....
	J	7.00 (c)	7.00 (c)	.....	.....
	K	7.00 (c)	7.00 (c)	.....	.....
	N	.....	.....	11.40 (b)	.....
Chlorine	A	11.30 (a)	24.90 (a)	51.00 (a)	.....
	B	10.00 (a)	.....	.....	.....
	C	140.00 (c)	140.00 (c)	.....	.....
	D	12.00 (c)	12.00 (c)	.....	.....
	G	50.00 (c)	50.00 (c)	.....	.....
Oxygen-consuming power	B	7.00 (c)	.....	.....	.....
	L	.....	0.58 (a)	.....	.....
	M	.....	2.00 (c)	.....	.....
	D	2.20 (a)	2.20 (a)	.....	.....

As the figures in the above table are those of authorities of equal repute it would not be taking undue liberty to say that a composite formed by taking the highest figures given under each heading would represent what the average potable water may contain. Such a composite would be represented by the following:

	Surface water[1]	Ground water.	Deep well.	Rain water.
Total solids	200	575	432	29.5
Free ammonia	0.12	0.12	High.	High.
Albuminoid ammonia	0.15	0.15	0.07	Trace.
Nitrite (nitrogen as)	0.0135	0.0135	.....	.....
Nitrate (nitrogen as)	7.00	7.00	11.40	0.03
Chlorine	140.00	140.00	51.00	8.20
Oxygen-consuming power	7.00	7.00	.....	.....

Having now a composite standard by which the quality of a water is to be judged let the analyses of a number of waters be taken and their quality be determined by comparison with this composite. An excess of any single ingredient above the quantity given in the composite will be considered sufficient to condemn the water as being unsafe.

	1.	2.	3.	4.	5.	6	7.	8.	9.
Total solids	144	236	140	42	170	450	43	769	294
Free ammonia	Trace.	Trace.	Trace.	Trace.	0.035	0.01	0.01	0.035	1.750
Albuminoid ammonia	0.035	0.015	0.01	0.04	0.04	0.06	0.34	0.005	0.016
Nitrite (nitrogen as)	None.	None.	None.	None.	0.01	0.006	None.	None.	None.
Nitrate (nitrogen as)	None.	4.00	None.	Trace.	6.40	22.00	None.	10.00	5.00
Chlorine	1.10	10.00	0.90	5.00	27.00	58.00	2.00	146.00	1.50
Oxygen-consuming power	0.50	0.35	0.35	0.15	0.20	.....	6.60	1.00	.....

According to this comparison waters Nos. 1, 2, 3, 4, and 5 are of good quality, while Nos. 6, 7, 8, and 9 are polluted. As we have a perfect knowledge of these waters let us see how these conclusions accord with the facts. Water No. 1 is from a well situated comparatively high up on a mountain side and well removed from all possible sources of pollution and is, without question, pure. Water No. 2 is from a spring at the foot of the same mountain on which the well of No. 1 is located. The water of this spring is, as will be shown later, subject to the influence of the drainage and seepage of every cesspool and stable in a village of 500 inhabitants and consequently can not be pure or free from pollution. It is, therefore, to be condemned, even though the quantity of each ingredient falls well within the limits given in the composite standard. Water No. 3 is from a spring on the mountain side far above the village mentioned in No. 2. There is absolutely nothing above the spring but uninhabited woodland. There is not a dwelling within half a mile; these are all below its level. There is, then, no possibility of pollution and the water must be pure. Water No. 4 is from a very favorably situated well,

40 feet deep. The chances in this case for pollution are exceedingly small and this, in connection with the result of the analysis, would lead the analyst to pronounce this a water of rather a high degree of purity. Water No. 5 is from a well 35 feet deep and is situated in the midst of a rather populous district. Under such circumstances this water consists, in part at least, of the ground water of the said district, and as such will contain the elements derived from cesspools and stables and therefore necessarily polluted and a water to be condemned. This was done on the result of the analysis alone, even though the quantity of any ingredient did not exceed that given in the composite standard. (Some time after this analysis was made the health department, acting on analysis of its own, ordered the well to be closed.) Water No. 6 is from a well about 30 feet deep, located in the heart of the city. Its location and the character of its surroundings would be sufficient to condemn the water, but an analysis proves it to be little better than sewage. (The well has been closed by the health authorities.) Water No. 7 would be condemned, according to the standard, because of the excessive quantity of albuminoid ammonia. According to a statement in his book on Water Supply, Chemical and Sanitary, from which this analysis is taken, Dr. W. P. Mason says that this water is from a mountain lake situated far away from all possibility of sewage contamination. This water must, then, be exceedingly pure, so far as pollution is concerned, even though there is sufficient albuminoid ammonia to condemn it according to the standard given. Water No. 8 is to be condemned because of the large quantity of nitrate and chlorine. This water was proved to be not only polluted but also infected, as will later be shown. No. 9 is from Lake Drummond (Dismal Swamp), the analysis given representing its composition in 1891. This specimen would be pronounced as worthless because of the enormous quantity of albuminoid ammonia, yet it was extensively used for years without, so far as known, any untoward results. It was considered a very pure water, and probably with good reason, as will be shown later.

The result of using the composite standard is to brand the impure waters Nos. 2 and 5 as pure and to condemn Nos. 7 and 9, waters of undoubted purity, as being unfit for sanitary purposes. Obviously such a means of determining the quality of a water is useless and dangerous.

The comparison with the composite standard having failed as a safe means by which the quality of a water can be judged, now let the significance of the individual ingredients and their relation to pollution be considered.

In discussing the total solids it is hardly necessary to mention the fact that the quantity of solid matter which a water will contain depends upon the nature of the geological formation from which it is

derived or through which it passes. While a standard for the total solids has been given, it is not difficult to see that such a standard would be applicable only to the neighborhood from the waters of which the standard was determined and valueless for any other locality.

The nitrogen content of water is a very important item. It is essential to remember that practically all of the nitrogen contained in a water entered it in the form of albuminous or albuminoid matter. Such substances are readily oxidized and decomposed, the products of such oxidation and decomposition being first the production of the free ammonia, next the conversion of the free ammonia into nitrites, and finally the oxidation of the nitrite to nitrate. Then, according to the time which has elapsed since its entrance and also to the degree of activity of the oxidizing and decomposing agencies to which it is subjected, the nitrogen of water will be found either in one or all of the following forms: Albuminoid ammonia, free ammonia, nitrite, and nitrate.

Let the significance of the albuminoid ammonia be now considered. As this is derived by the moist oxidation of nitrogenous organic bodies, then the quantity obtained will be a measure of the quantity of such substances present. But would it, even in any quantity, indicate the presence of animal products? Nitrogenous organic matter can be derived from vegetable as well as from animal sources, and no matter what the source it will by the same treatment yield albuminoid ammonia. The presence of the latter, then, no matter what the quantity, can tell nothing more than that the water contains some kind of nitrogenous organic matter. Suppose that such organic matter had been sufficiently oxidized to destroy its albuminoid nature. If in this condition it would not be possible to obtain albuminoid ammonia from the water, no matter what quantity of nitrogenous organic matter was originally present. The conclusion, then, that albuminoid ammonia even if found in large quantity does not tell whether it is of animal or vegetable origin is obvious, and hence its presence can not be accepted as indicating pollution. Also that its absence is not proof that pollution has not occurred, for this might have happened at a sufficiently remote period to have permitted the destruction of the albuminoid nature of the polluting substance. Briefly stated, the conclusion is that albuminoid ammonia even in large quantity does not of itself indicate pollution nor does its absence insure purity.

The quantity of albuminoid ammonia failing to give much aid, let us see what information the free ammonia gives. As ammonia results from the oxidation or decomposition of nitrogenous organic matter, then, following the same reasoning as given in the preceding paragraph, the same conclusion, in part at least, must be reached. A

large quantity indicates the presence, formerly, of large quantities of albuminoid material, while its absence indicates either absence of organic matter or its oxidation to nitrites and nitrates. Its presence does not prove and its absence does not preclude pollution.

The nitrites in water are perhaps given more attention than any other ingredient, as their presence is considered by many to positively indicate pollution and their absence to insure purity. As they result from the oxidation or decomposition of nitrogenous organic matter of either animal or vegetable origin, it can not be said that their presence is proof positive of pollution. To illustrate this, take the water of springs in which there is a collection of fallen leaves and other decaying vegetable matter. The water from such springs (and such springs are numerous) nearly always show the presence of nitrites even though the springs are so situated as to preclude the possibility of pollution. Indeed the presence of a small quantity of nitrite is normal to spring water, as has already been indicated in the composite standard. Again, let the pollution be of recent origin; in such cases decomposition has not yet set in and consequently nitrites will not be found even if the degree of pollution be great. Such a state of affairs is often found in fresh sewage. Contrary to the last-named condition consider the case of a water in which pollution occurred sufficiently far back to permit the complete oxidation of the organic matter. In this instance also, and such instances are of very frequent occurrence, nitrites will not be found even though the pollution might have been extensive. From the evidence given we are forced to conclude that the presence of nitrites is not positive evidence of pollution nor is their absence by any means conclusive proof of purity. How dangerous it would be to accept the absence of nitrites as a guarantee of purity is well illustrated by water No. 8.[a] It should be mentioned here, however, that if a reaction for nitrites is obtained, it is better, if tests for other ingredients can not be made, to consider the water suspicious.

The last of the nitrogenous products to be considered are the nitrates. Representing as they do the final stage of oxidation and as oxidation is rapid and always in progress, the nitrates can be looked on as the measure of the nitrogenous organic matter which the water formerly contained, provided the oxidation of the organic matter has been complete. But since the nitrogenous organic matter from both animal and vegetable sources yields nitrates on oxidation, the nitrates alone can not inform us of the kind of organic matter added, and hence do not necessarily indicate pollution. Again, when the pollution is of very recent origin and the final stage of oxidation has not been reached,

[a] Owing to the ready transformation of nitrite to nitrate the quantity of the former present is always relatively very small—0.01 part per million of N as nitrite being considered as excessive.

nitrates will not be found. The presence or absence, then, of this ingredient does not give us any definite information as regards purity.

Chlorine is present in water principally in the form of sodium chloride. It is derived from the air and soil or it may be added as a constituent of sewage. Near the coast it may result from infiltration of sea water. When it is considered that from springs there is obtained unpolluted water which contains quantities of mineral matter varying from a few parts per million to an amount which often exceeds that present in sea water, and, also, that the nature of this mineral matter varies greatly in character, sometimes consisting largely of sodium chloride, sometimes of sodium carbonate or sulphate, or, instead of the sodium, calcium and magnesium salts may predominate, it will be readily understood that it is difficult to establish a standard of chlorine for spring or other ground water. It is owing to the varied nature of the geological strata through which it passes that waters of such different composition result. That a difficulty does exist in establishing a standard of chlorine is well illustrated in the widely divergent figures given by the various authorities cited, these figures ranging from 10 to 140 parts per million. Surface waters will also differ in composition according to the character of the sources from which they draw their supply; this difference, however, is not nearly so well marked as in ground waters. In rain water collected near the seacoast with utmost care to prevent contamination the quantity of chlorine will be much greater than in rain collected far inland under the same conditions. The quantity of this ingredient, then, can not of itself definitely determine pollution, for while very small amounts are the more common, yet it is not a difficult matter to find a pure water which contains a very large measure of chlorine.

The last item for consideration is the oxygen-consuming power. As nonnitrogenous as well as nitrogenous, and vegetable as well as animal matter consumes oxygen, then the quantity of the latter required is simply a measure of the quantity and not an indication of the kind of organic matter present. On the other hand, if the organic matter has been fully oxidized by natural processes, as so often happens, then the quantity of oxygen which the water will consume is practically nil, even though much organic matter might originally have been present. Here again we have an item which alone tells us nothing, for a pure water containing vegetable matter will have a high oxygen-consuming power, while an extensively polluted one may consume but little.

If both the composite standard and the quantity of the individual ingredients fail as a means for the purpose, how then is the quality of a water to be determined? Let it be recalled that rain falls upon the soil and, in passing through the latter to reach the so-called water

stratum, it dissolves a practically constant quantity of mineral and organic matter and then reappears upon the surface as a spring, or is obtained from the ground through a well. The composition of this pure water is found upon analysis to be, for example, that of A in the following table:

	A.	B.	C.	D.	E.	F.
Total solids	100	101	101	101	101	101.00
Albuminoid ammonia	1	2	1	1	1	1.25
Free ammonia	1	1	2	1	1	1.25
Nitrogen as nitrite	1	1	1	2	1	1.25
Nitrogen as nitrate	1	1	1	1	2	1.25
Chlorine	3	3	3	3	3	3.00
Oxygen-consuming power	1	2	1	2	1	1.50

Suppose, now, that before reaching the surface the water should encounter a larger quantity of vegetable matter than usual. More organic matter would naturally be dissolved and as a consequence the water would be found to have, according to the degree of oxidation which has occurred, the composition represented by either B, C, D, E, or F in the above table. In this table and the one which follows the figures given are purely arbitrary and do not represent quantities usually found. They were considered as the best with which to give an illustration. Inspection will show that either one or all of the nitrogenous products are increased in quantity while the mineral constituent, chlorine, remains unchanged. This is what would naturally be expected, for while the soluble nitrogenous portions of plants is small it far exceeds the soluble mineral constituents.

Now let this pure water A, before it reaches the surface, come in contact with the animal matter such as urine. Remembering that animal products always contain a large quantity of soluble mineral matter, especially chlorides, and equally large quantities of soluble nitrogenous organic substances, then, according to the degree of oxidation to which the organic matter has been subjected, the water would have the composition represented by either G, H, I, J, or K in the following table (A is again given for comparison):

	A.	G.	H.	I.	J.	K.
Total solids	100	104	104	104	104	104.00
Albuminoid ammonia	1	2	1	1	1	1.25
Free ammonia	1	1	2	1	1	1.25
Nitrogen as nitrite	1	1	1	2	1	1.25
Nitrogen as nitrate	1	1	1	1	2	1.25
Chlorine	3	6	6	6	6	6.00
Oxygen-consuming power	1	2	1	2	1	1.50

Inspection of this table reveals exactly the condition which one would expect, viz., an increase in the quantity of one or all of the nitrogenous products and at the same time an increase in the quantity of chlorine.

On examining the results given in these examples it becomes apparent that we have a most efficient method for determining the quality of water. Stated briefly, this is, that if on analysis we find an increase in the quantity of any one or all of the nitrogenous products over that contained in the pure water from a like source in the same neighborhood from which the specimen comes and the chlorine remains unchanged then the water has suffered in quality by the addition of vegetable matter, but it is not polluted. If, however, there is an increase in the quantity of one or all of the nitrogenous products and at the same time there is an increase in the chlorine, then animal matter has been added and the water is polluted and dangerous. As is apparent, such a method for determining purity requires a complete sanitary analysis.

This method for determining purity will probably not meet with the approval of all, for the reason that it is necessary to have in one's possession the analysis of the pure water from every district in the country before an opinion in regard to the quality of a particular specimen of water can be expressed. Such information is not always readily accessible, however, and, while admitting that the objections on such premises are partly justified, it is firmly believed that the method described is alone practically available as promising positive conclusions. That it is so is clearly demonstrated by the fact that various State boards of health and the United States Government have been and are now engaged in establishing normals, especially for chlorine, throughout the country. So far this work has been completed for the New England States and for the State of New York.

That it is the complete and not the partial analysis of the specimen, and the manner in which this analysis compares with that of the pure water of the same locality, that must be considered before an intelligent opinion as to quality can be rendered is well illustrated in the case of water No. 2. If the character of this specimen had been judged from the quantity of chlorine present or by the absence of nitrite, or by the amount of the ammonias, or by all of these combined, it would unquestionably have been pronounced a water of good quality. It is only when the quantity of the last of the nitrogenous products, the nitrates, is added to the picture and the extent to which this and the chlorine deviate from that contained in the pure water of the same neighborhood is noted that the true quality of this water, which, as already stated, must be very poor, is revealed. The attempt to base judgment as to purity upon the presence or absence of a single ingredient can not be too strongly condemned, as such procedure can easily lead to serious consequences.

Having given the method, let it now be applied to the waters given in the third table, for it was by this means that their quality was determined.

When the history of the waters Nos. 1, 2, and 3 of this table is given it will perhaps supply the best illustration of pollution and its effect on composition that could possibly be obtained.

Several years ago it was the writer's fortune to visit a village of about 500 inhabitants located in a mountainous district. Shortly after arrival a spring, the water of which was held in high esteem by the inhabitants of the neighborhood, was pointed out, with the assurance that a purer, clearer, cooler, or better water could not be found. Upon examination it was found that the spring had been well walled up and the ground for some distance around paved with stone, the whole being further protected by a large and substantial shed. Superficial examination in its physical aspect corroborated this general opinion, but the location of the spring and the lay of the land roundabout, and the location nearby of a large number of dwellings, led to the belief that the water must necessarily be affected by the proximity of the large number of privies and stables which a village of such size must contain. Standing at the spring, which is located at A in the accompanying map, one would at once be struck by the fact that the land in front and on both sides sloped rather rapidly toward it, thus leaving it in more or less of a pocket. By far the larger part of the village is built on these comparatively steep slopes, thus virtually hemming in the spring on three sides. It seemed questionable that this water, with such surroundings, could possibly escape pollution. For experimental purposes, a little prospecting in this mountainous country led to the discovery of a well and a spring in the neighborhood, shown in the accompanying map as B and C. respectively.

To better illustrate the location and surroundings of the spring A and also that of the well and spring referred to, and to be discussed later, the accompanying map is presented for reference. While not accurate, it gives a fair representation of distances, elevations, contour, and relations. Such structures as privies and stables are not indicated, for their number and location can be imagined when the number and location of the dwellings is taken into account.

The search for the pure waters resulted in finding the well and spring indicated above. The well is, as shown by the contours, situated well up on the hillside at an elevation much greater than that of any part of the village and greater even than that of the house with which it is connected. As there are no dwellings or other buildings on that part of the mountain above this well and as the latter is too far above the village to be affected by any drainage from it, it was felt that the water would be pure. The analysis No. 1 in the table confirmed this view, for the purity of a water is unquestioned when it contains, as this does, the minimum of chlorine and nitrogenous products to be found in a natural water. The almost complete

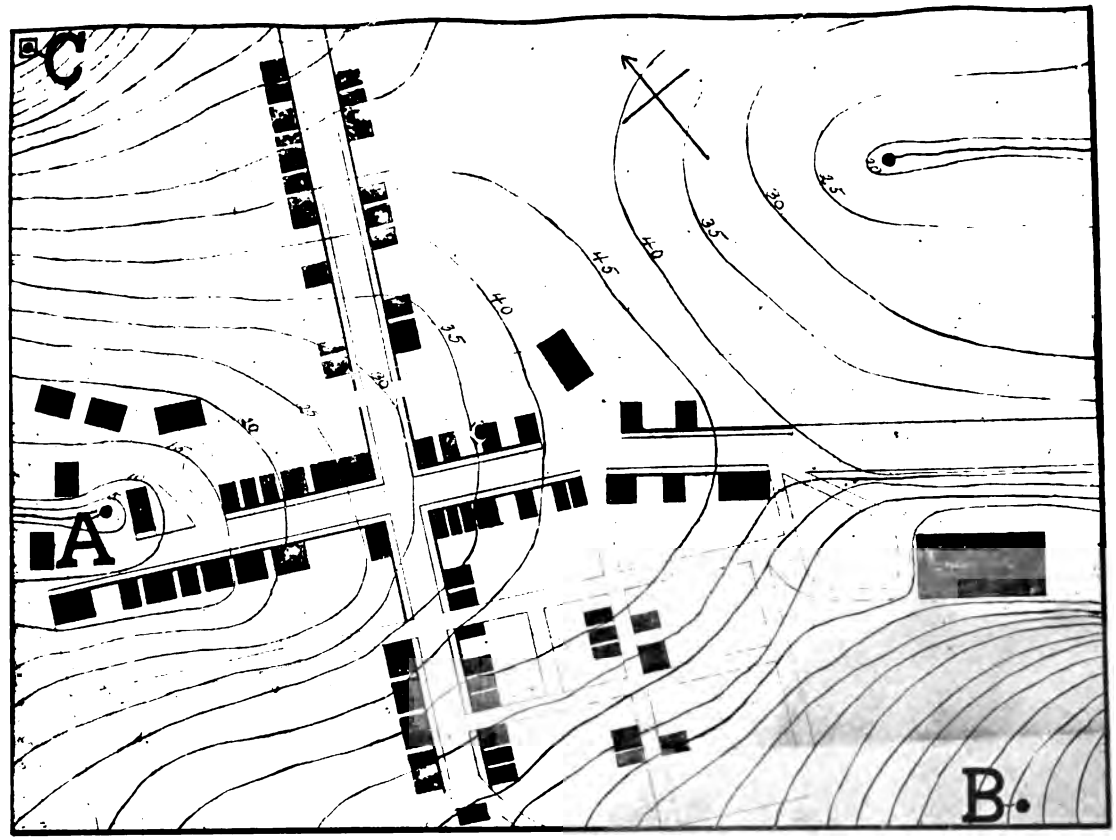


FIG. 1.—CHART SHOWING LOCATION OF WELLS AND SPRING. SCALE: 1 INCH TO 320 FEET; CONTOURS, 5 FEET.

absence of nitrogenous products is especially significant. A survey of the surroundings of the spring C seemed to give reasonable assurance that this water also must be pure, for, as with the well, it was situated high up on the mountain side. Save for one small dwelling situated about 100 feet distant and a little below its level, there were no habitations within half a mile of this spring and absolutely none on that portion of the mountain above it, the whole mountain being practically uninhabited. In a situation such as this, how could the water be other than pure? Although located on different mountains, the waters of the well and spring seemed to be derived, as nearly as inspection alone could determine, from exactly the same geological formation. Under such circumstances it was considered highly probable that these waters, in addition to being equally pure, would also have about the same composition. The analysis of the spring water, No. 3, proved this view to be correct, as inspection will show.

Since these two waters are without question pure and have the same composition, then the water of spring A, which is also in the same geological formation and not far removed from the sources of the others, might reasonably be supposed to be likewise pure, unless influenced by the proximity of the village. The analysis No. 2, instead of showing the same composition as Nos. 1 and 3, reveals the presence of a greater quantity of total solids and very much more chlorine and nitrate.

The question: "Whence could this increase, especially of the chlorine and the nitrate, come," naturally now arises. Certainly not from vegetable sources, for the latter, while containing comparatively large quantities of nitrogenous substances, contain but very minute amounts of chlorine or other mineral matter. Then if it is not from vegetable sources it must be derived from substances of animal origin, and if so, the water is polluted, and therefore dangerous.

It would be well also to consider the source of the animal matter. According to investigations on the subject, it has been determined that when the population is increased to the extent of approximately 20 persons to the square mile, 0.1 part per million of chlorine is added to the water flowing from such a district. The great increase in the chlorine found in this water over that found in the water of either the spring or well would indicate that it is derived from a much more populous district than either of the others. As the country surrounding the village is but sparsely settled, it appears very conclusive that the drainage and seepage from the village is the cause of the marked difference in composition of the water and that of the other two.

There is still another point to be raised in regard to this water. Could it under any circumstances, from the analysis, be pronounced a potable water? While the quantity of nitrate is sufficiently great to indicate a water of a doubtful past, yet if it had been obtained

from a point much nearer the seacoast (this specimen comes from a point 125 miles or more inland) the chlorine would without question closely correspond to the normal for that neighborhood. The quantity of nitrate, then, would not arouse much, if any, suspicion, for such evidence would point to the previous addition of vegetable rather than animal matter. Without a knowledge of the normal, by which it must be governed, it might be said that this water could, with good reason, be pronounced potable. Indeed, at least some of the authorities whose figures have been quoted would without hesitation pronounce this a water of good quality.

The point might probably be raised that, because of the complete oxidation of the organic matter, the latter is rendered harmless and the water is potable. The answer to such a contention would be that it is now very generally acknowledged that even though the organic matter of a polluted water be thoroughly oxidized, there is just as much danger in drinking it as there would be in water the pollution of which was of very recent origin and in which the organic matter is still in a fresh or unoxidized state. An excellent illustration of the danger remaining in such a water will be given when specimen No. 8 is discussed.

Although a great deal of speculation has been introduced in the discussion of these three waters, the results obtained seem to so completely confirm the theories advanced that this case may be considered as one which ideally illustrates pollution and its effects.

Attention is invited to another group of waters, namely that consisting of Nos. 4, 5, and 6. Water No. 4 is from a thinly settled district to the north of Washington, D. C., and is very favorably situated. As the analysis conforms very closely to the normal of the neighborhood the water is to be considered of good quality. No. 5 is from a thickly settled suburban district some distance south of the location from which No. 4 was obtained. This water, varying as it does so greatly from the normal of the neighborhood, indicates a high degree of pollution. No. 6 is from the heart of Washington, about three miles southeast of the locality from which No. 5 was taken. Its analysis proves it to be little if any better than completely oxidized sewage. This group of waters serves well to illustrate the influence of increasing population on the composition of water, for the distance between the source of No. 4 and that of No. 6 is not more than 15 miles, and being in practically the same geological formation all of them should have the same composition, if pure.

Water No. 7 is, as stated elsewhere, undoubtedly free from pollution. This example is given as one which clearly demonstrates the danger of judging quality from the contained quantity of a single ingredient and also the effect of the addition of vegetable matter. This water would be condemned by many authorities on either the quan-

tity of the albuminoid ammonia or the oxygen-consuming power, yet the large quantities of both these are due to vegetable matter, for the water is derived from peaty sources. Without having a personal knowledge as to the particular neighborhood from which it comes, nor its governing normal, it seems safe to assume that it conforms to the latter, for such an authority as Doctor Mason would not pronounce it pure without excellent reasons for so doing.

No. 8 is an excellent example demonstrating the danger still lurking in a ground water in which the organic matter has been completely oxidized. While efforts were being made to determine the source of some cases of typhoid, suspicion fell upon this water because of the location and the surroundings of the shallow well from which it was drawn and also because the victims were consumers of it. Upon analysis, although no nitrites and but little of either of the ammonias were found, the excessive quantity of nitrates and the great increase of the chlorine above the normal for the neighborhood were sufficient to indicate such extensive pollution that further investigation was warranted. These investigations proved beyond all possible doubt that this water was the source of the disease. The entire absence from and the very small quantities of the free and albuminoid ammonias in this water are two points which should be carefully noted.

No. 9, as already indicated, is considered as a pure water. This view is doubtless correct despite the enormous quantity of the albuminoid ammonia and the nitrate, for, as the normal of chlorine for the neighborhood from which the specimen comes is certainly not less than the quantity found in the specimen, positive evidence of the addition of animal matter is lacking. Such quantities of nitrogenous products would, if due to pollution, be accompanied by much more chlorine. The nature of the source of the water in addition to the lack of chlorine would indicate the addition of vegetable matter. Under such circumstances the probability of pollution is small and consequently the water is considered to be pure. This specimen supplies an excellent example of the possibility of the derivation of large quantities of nitrogenous products from vegetable sources. It is only fair to state, however, that such large quantities of nitrogenous ingredients are much more commonly derived from animal than from vegetable matter.

With the exception of Nos. 7 and 8 the analyses given were made in the Naval Medical School laboratory and are, except 7, 8, and 9, those of waters whose histories are known through personal visits to, and a study of, the localities from which they come. Under such circumstances it is felt that the verdict given in each case is justified, as the results of the analyses reflect so well the conditions surrounding these waters.

In the instruction of the students at the Naval Medical School it is usually so arranged that at least three waters, one pure, one polluted, and one containing vegetable matter, are submitted for examination. As it is seldom possible or convenient to obtain specimens which are naturally polluted or naturally contain vegetable matter, the expedient is resorted to of making them artificially. For the pure water, that from the tap is used; for the polluted water, a little urine is added to the water from the tap, the mixture being allowed to stand for some time to permit oxidation; for the water containing vegetable matter, a few leaves are added to the tap water and allowed to macerate for an hour or two. The leaves are then removed and the liquid allowed to stand for a long period to permit oxidation. The following table gives the results of the analysis of such a set of waters:

	Polluted.	Tap.	Vegetable.
Total solids	155	82	102
Albuminoid ammonia	0.21	0.037	[illegible]
Free ammonia	0.07	0.01	[illegible]
Nitrogen as nitrite	Trace.	None.	[illegible]
Nitrogen as nitrate	2.15	0.30	[illegible]
Chlorine	11.20	2.00	[illegible]
Oxygen-consuming power	2.00	0.50	[illegible]

Inspection of this table will positively demonstrate the fact that pollution results in an increase of chlorine and also in one or all of the nitrogenous products and that when vegetable matter is added one or all of the nitrogenous products are increased, while at the same time the chlorine is but little affected. An example is also afforded of a highly polluted water containing but the smallest possible quantity of nitrite and a potable water containing it in excessive quantity.

If the polluted specimen had been subjected for a little longer period to oxidation, the resulting water would be pronounced by most analysts as potable, provided nothing of its history was known. Many specimens such as this are produced by natural processes, and it is only when their history and the normal of the neighborhood is known that their true character becomes evident.

That the results obtained by artificial pollution are the same in character but not necessarily the same in quantity as those brought about by natural means, is clearly demonstrated by comparing the analysis of the polluted water in the table above with the analysis of water No. 2, before given.

Although many other equally good examples are undoubtedly available, it is believed that those given will suffice to make clear the objective points of this article, viz: First, that a composite standard for *general* application is an absolute impossibility; second, that the presence of any single ingredient in a quantity in excess of a definite

or arbitrary quantity does not necessarily prove pollution; third, that the absence of a particular ingredient does not insure purity; and, fourth, that it is only by the complete and not a partial sanitary analysis that the quality of a water must be determined.

It will perhaps be noticed that in this discussion reference to deep well and rain water, except as mentioned in the first and second tables, has not been made. This omission was considered advisable, because, as the greater part of the water which we use consists of surface and ground water, these two varieties are by far the more important; and, also, because the different conditions to which both deep well and rain water are subjected require that they be treated in a somewhat different manner.

AUTHORITIES.

The authorities cited in this article are: (A) Rivers Pollution Commission of Great Britain. (B) Dr. A. R. Leeds. (C) Dr. J. A. Wanklyn. (D) Michigan Standard of Purity. (E) C. B. Fox. (F) Dr. J. W. Mallet. (G) Doctor Frankland. (H) Vienna Water Commission. (I) Hanover Water Commission. (K) Brandes Water Commission. (L) Dr. Charles Smart. (M) French Standard of Purity. (N) This figure was selected from a list of analyses of deep-well waters, the analyst and the author not being known.

A SUPPLEMENTARY NOTE ON ELEPHANTIASIS OF THE SCROTUM—ITS OPERATIVE CURE.

By Passed Asst. Surg. A. M. FAUNTLEROY, U. S. Navy.

In the United States Naval Medical Bulletin No. 2 (vol. 1, July, 1907), a report on this subject embracing a detailed description of the operative treatment, as practiced among the natives of Samoa during my period of service at the naval station, Tutuila, was published. It was suggested that it might be interesting in connection therewith to exhibit the photographs of a few typical cases showing the appearance before and after operation, and in doing so it seemed appropriate and desirable that some further comment be made.

The cases here illustrated were selected to show: Fig. 1, a typical scrotal tumor; Fig. 2, the largest of my series; and, Fig. 3, the oldest man operated upon. The series above mentioned includes 149 operations, with but one death, and the operation in every case was that described in the bulletin above indicated.

With reference to the operation I wish to emphasize certain features of the technique which to me seem important and which my experience demonstrated as necessary in attaining the best results.

First, the tourniquet described by some authors is impracticable, undesirable, and unnecessary. It requires extra assistance and elaborate precautions to prevent infection of the operation site and in one way or another imposes annoying, if not serious, delays. Moreover, it has but slight, if any, effect in controlling hemorrhage from deeply placed vessels and superficial vessels rarely require ligation, clamps and torsion usually being sufficient. The vessels that require ligature are in the septum and a tourniquet has absolutely no influence in lessening bleeding from them. These vessels should be picked up immediately they are cut and then tied.

Second, in 60 per cent of my cases it was found necessary or advisable to remove one testicle on account of cystic degeneration, infiltration, or enlargement of various natures, etc. It is important to investigate the condition of these organs at the time of operation to determine the need of castration. This additional procedure but slightly complicates the operation and does not impose an added risk, nor have any ill mental effects resulted. Indeed, the operation as a whole, whether castration (unilateral) has been performed or not, exerts a very apparent general benefit upon the patient and the more cheerful appearance observed in the facial expression shown in the accompanying photographs, illustrating the results of the operation, is characteristic of almost all the cases.

THE PHOTOGRAPHS.

Case I.—This is the usual size of scrotal tumor which presents for operation. It weighs between 25 and 30 pounds. In this case one (right) testicle was removed. He was the father of two children at the time of operation, and eleven months after operation his wife gave birth to another child.

Case II.—This was the largest of my cases, the tumor weighing 85 pounds. Both testicles were normal and consequently were left. The patient was discharged from the hospital on the eighteenth day with perfect functional use of his sexual organs.

Case III.—This was the oldest man of my series (nearer 80 than 70 years), and he also made the quickest recovery, having been discharged from the hospital on the tenth day. The average time of discharge of my cases was the sixteenth day from date of admission.

SUGGESTED DEVICES.

A SIMPLIFIED TURK'S COUNTING CHAMBER.

By Passed Asst. Surg. C. S. BUTLER, U. S. Navy.

The excess of lines in Turk's counting chamber which do not function, but only serve to confuse, suggested the possibility of having ruled a chamber which combines the Thoma for the central square millimeter with the Turk ruling for the eight square millimeters ranged around this central one, but with only those lines projected from this central ruling to the border lines, which function in producing Turk's ruling in the eight squares around. This was suggested to Leitz's agent who had the chamber made. The accompanying drawing will show the ruling better than a description. The advantage of it is that it is the simplest blood-counting chamber for counting both red and white cells in the same diluting fluid. Many of the lines in the ordinary Turk ruling have no function after passing out of the central small ruled area, but they are extended because it is difficult to stop the ruling exactly on the lines bordering the central square millimeter. They, however, produce a maze at four parts of the ruling, which makes it more difficult to explain to students and unnecessarily confuses all who have to do blood counting.

CLINICAL NOTES.

REPORT OF CASES OF CEREBRO-SPINAL MENINGITIS TREATED WITH THE FLEXNER-JOBLING SERUM.

By Passed Asst. Surg. H. F. HULL, U. S. Navy.

Three patients with cerebro-spinal meningitis were treated with the Flexner-Jobling serum at the Naval Hospital, Newport, R. I., within the past eight months, in which death resulted in two. Curiously enough the one with the severest symptoms on admission recovered.

All three were admitted from the Training Station after having been there but a short time, two for two months, and the other for about four months. One patient was from Illinois, one from Tennessee, and one from Massachusetts; thus showing how widespread is the disease if it were contracted prior to enlistment. Should, however, it have been contracted here, it is hard to explain why these three were picked out from the hundreds of boys constantly passing through, and this, too, in spite of efficient sterilization of the infected barracks after the development of each case.

We do not wish to give very decided opinions as to the efficacy of the treatment used, and report the cases that they may be added to the long list already written up. A final analysis of this list will undoubtedly be made by an authority, and the results thus obtained will be of benefit.

CASE I.

F. F. C., apprentice seaman, aged 17 years 5 months, native of Illinois, was admitted on November 2 in a semiconscious condition. He could be aroused but refused to answer questions. He had been suddenly taken ill the night before with headache, nausea, and projectile vomiting. He was found in his hammock in the morning in this unconscious condition and transferred to the hospital. On admission he was found to have well-marked signs of the disease, viz. rigid neck, petechial eruption over the chest, abdomen, and flexor surfaces of thighs. Kernig's sign was present and its elicitation caused sufficient discomfort to arouse him so that he answered a few questions intelligently. Pupils were equal and reacted normally. Marked photophobia was present. Temperature was 100, respiration 16, pulse 64. Two days later (November 4) spinal puncture was done

FIG. 1.—CASE I. BEFORE OPERATION.

FIG. 2.—CASE I. AFTER OPERATION.

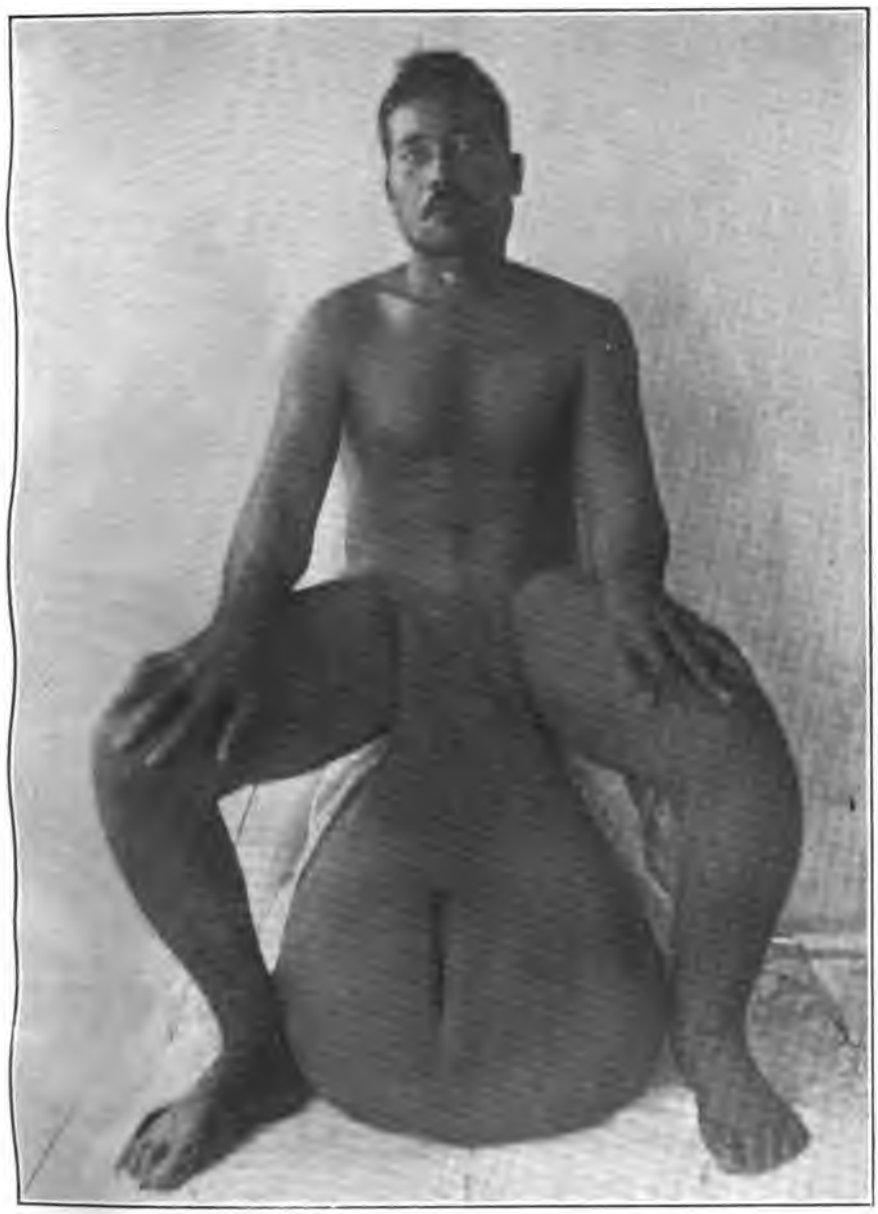


FIG. 3.—CASE II. BEFORE OPERATION.

FIG. 4.—CASE II. AFTER OPERATION.

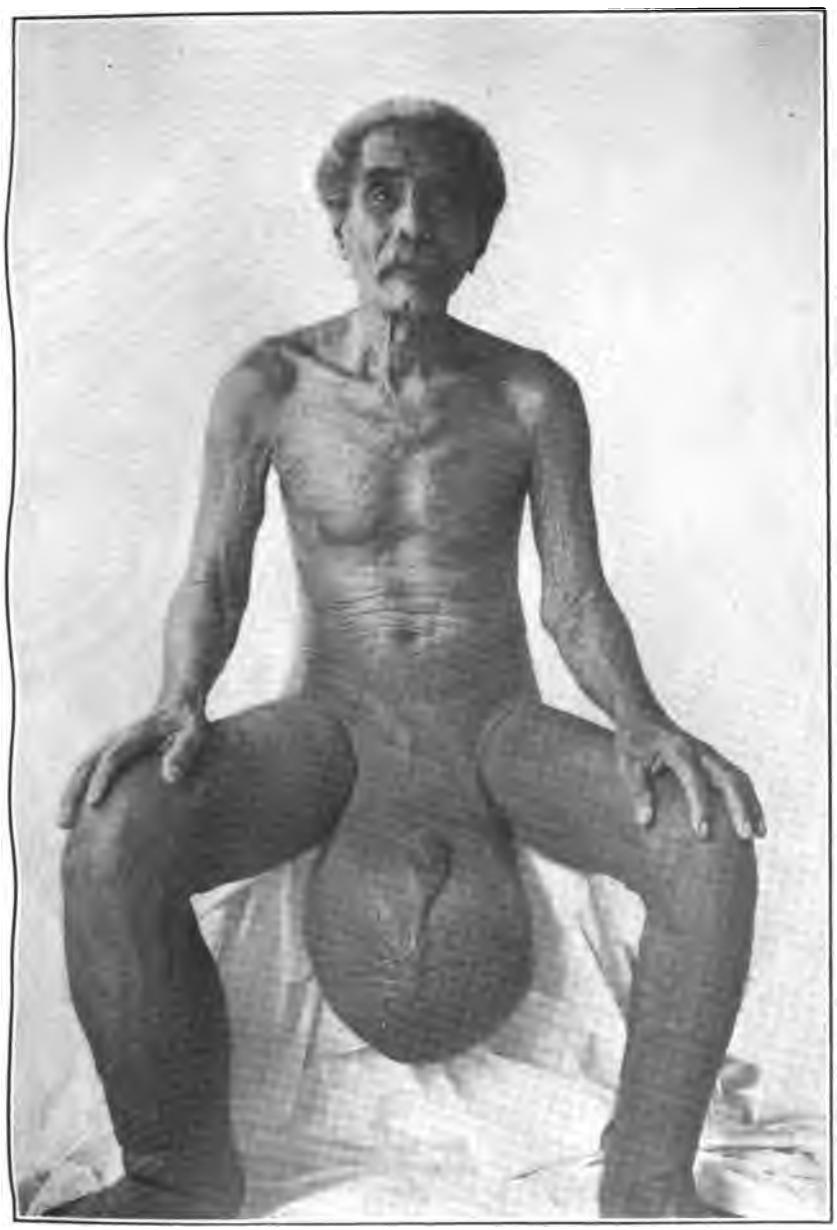


FIG. 5.—CASE III. BEFORE OPERATION.

FIG. 5.—CASE III. BEFORE OPERATION.

FIG. 6.—CASE III. AFTER OPERATION.

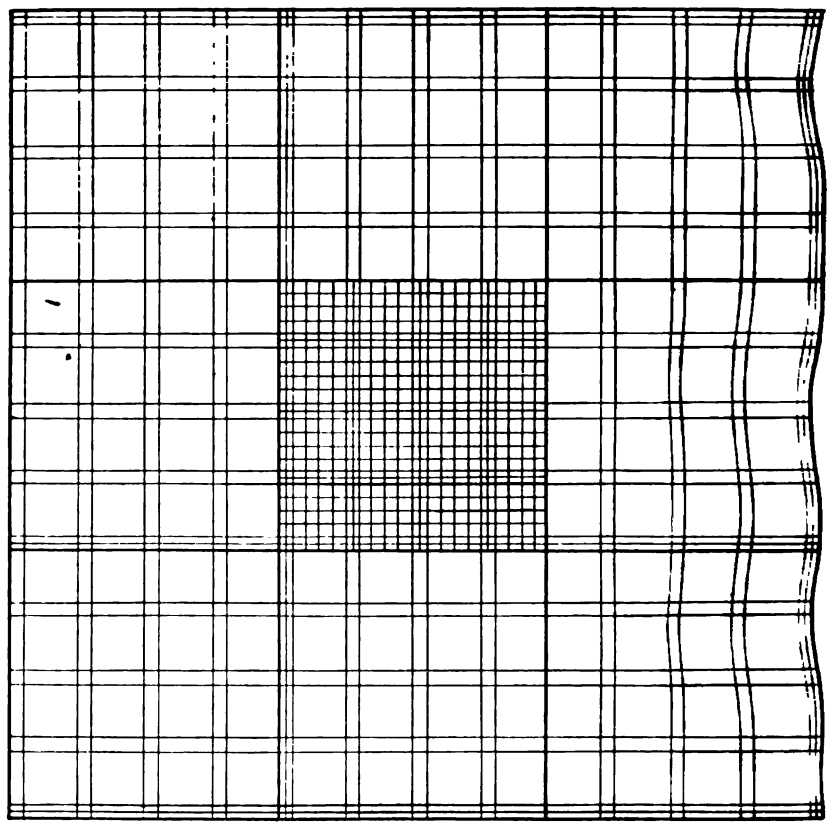


FIG. 1.—DRAWING TO SHOW MODIFIED RULING OF SIMPLIFIED TURK'S COUNTING CHAMBER.

and about 4 c. c. of thick purulent fluid was withdrawn. Microscopical examination showed this to be full of pus cells in which were found diplococci, which decolorized by Gram. They were therefore called the Diplococci of Weichselbaum. There seemed to be an average of two organisms per pus cell. Not knowing at this time of the Flexner serum the patient was treated symptomatically. Although he appeared to improve from time to time yet his condition gradually became worse. He had intense frontal and occipital headache, and was cross and irritable; the temperature was irregular, from 98° to 103° or 104°. He became emaciated rapidly, had involuntary passages of urine and feces, and rigidity with opisthotonos became marked.

About November 19 the temperature reached normal, and from then on till death (in March) was not above 99°, except on two or three occasions. Despite the improvement in temperature his condition was steadily growing worse up to the time of the serum injections in December. Late in November I saw a short note in a newspaper about Flexner's serum, and as we had two cases here then, I wrote to Doctor Flexner asking for information. He at once telegraphed that if the diagnosis had been verified bacteriologically he would send some serum. Fortunately this had been done, so he at once sent the serum with directions as to its use. It is only fair to say that from the first Doctor Flexner questioned the value of the serum in this first case, for it was of nearly a month's standing at that time. Prior to the first injection the following note appears in the case paper:

Worse, stiffer, looks sicker, is nauseated, urinates in bed, somnolent (he took no notice of his surroundings), legs and back stiff, opisthotonos marked.

The first injection was given on December 2. The effect of the serum on the cerebro-spinal fluid should be noted. Thirty c. c. of the cerebro-spinal fluid was withdrawn. It was not under pressure and flowed drop by drop. It was turbid and soon separated into serum and dirty gray-reddish clot. Examination showed pus cells in large numbers, but they appeared to be old. They had fragmentary nuclei and did not take the stain well. Diplococci were few in number and were found in the younger cells. None were extracellular. A few lymphocytes were seen. Thirty c. c. of Flexner's serum was injected.

December 3. More cerebro-spinal fluid withdrawn. Examination showed fewer organisms; in fact there were only two meningococci seen in a systematic study of the whole smear. The pus cells appeared to be of a younger type. The fluid was straw color and deposited a much less amount on standing; 30 c. c. of serum given.

December 4. Thirty c. c. of serum given. Examination of the fluid removed showed only a few pus cells, but the organisms were relatively more frequent. A slight pellicle only formed on the specimen.

December 5. Fifteen c. c. of cerebro-spinal fluid withdrawn. It was straw colored and deposited no sediment. Two smears were examined for meningococci with negative results. The fluid was then centrifuged and the sediment examined; pus cells, lymphocytes, and diplococci found: 115 cells were counted; 85 were pus cells with no organisms in them; 8 were pus cells with one organism to each cell; 22 were lymphocytes. In a general way the fluid was clear; 30 c. c. of serum was injected.

December 7. Thirty c. c. of serum was injected. The fluid withdrawn showed a fewer number of pus cells and an increase in the lymphocytes. A search of twenty minutes showed only 3 organisms, all intracellular.

December 8. The fluid withdrawn was absolutely negative for presence of organisms; 30 c. c. of the serum was given. This was the last injection, for his condition had steadily improved almost from the first dose of the serum.

As regards his general condition, compare the note of December 2 with that made on the 4th. "Brighter and decidedly less stiff."

December 5. "Has no pain, answers questions rationally, is less somnolent, and takes nourishment better."

Through the next four or five days he continued to improve, his appetite increased, he was less stiff, his bed sores began to heal, and the outlook began to appear brighter. But hydrocephalus was developing and showed itself on December 16, on which date he had 8 convulsions, each one lasting about fifteen seconds. They began on the right side of the face, extended to the left arm, and soon became general. During the intervals he had lateral nystagmus of both eyes, the pupils were equally contracted, but they reacted to light. There was no strabismus. Under the exhibition of morphine and sodium bromide they soon stopped and did not recur.

On December 31 he had an attack of acute respiratory failure, requiring artificial respiration for a considerable length of time. His heart would beat full and strong as long as Sylvester's method was kept up, but as soon as this was stopped, it became weak, rapid, and irregular. He recovered from this failure of respiration all right, his condition improved steadily, and he began to grow fat. He was up in a wheeled chair for three to five hours daily. On January 15 his left arm became flaccid and apparently paralyzed, but in a few days he recovered the use of it again.

February 29 he had spasms of the left side of the face, a recurrence of pain in the neck and stiffness as shown by Kernig's sign. His right pupil was contracted, while the left was dilated. The next day he had no pain and expressed himself as feeling all right, but during that night he died suddenly from failure of respiration, probably due to pressure.

In this case there seems to be little doubt but that the serum cleared up the cerebro-spinal fluid, decreased the number of meningococci, and increased both relatively and actually the number of lymphocytes. Clinically it cleared up the mental condition and put the boy in such shape that he could take and assimilate more food and thus give him a better chance to overcome the infection. As to its specific effect on the disease process it would be hard to draw conclusions, for it was given too late in the course of the disease.

CASE 2.

R. B. H., apprentice seaman, aged 19 years 1 month, native of Tennessee, was admitted on November 25, 1907, with a slight temperature (99.6), sore throat, questionable petechial rash, headache, nausea, and vomiting. He was delirious, could be aroused, but answered questions at random. The pain was located in the back of the neck, but there was no stiffness there. Kernig's sign was not well marked. His condition grew gradually worse with more fever (101°), great restlessness, intolerable headache, and increasing delirium, until the night of November 28, when his temperature rose to 104.8° and he became comatose. It was impossible to arouse him from this condition. The stiffness was at this time well marked, tache-cerebral was present, and there was loss of the organic reflexes. A purulent conjunctivitis was present, and although the discharge was examined for the diplococcus of Weichselbaum the organism was not found. Hot baths were given at once and the severe symptoms somewhat relieved. The next day spinal puncture was done and a Gram decolorized intracellular diplococcus found present in large numbers. There were apparently from 6 to 8 organisms per pus cell, and about every tenth cell contained the germs. There was no improvement in the condition up to December 2, at which time he was wildly delirious, extremely restless, temperature very irregular, and the pulse rate steadily going up till it reached 120. He was continually trying to get out of bed or feeling for imaginary objects in the air. On December 2 another spinal puncture was done and a small amount of cerebro-spinal fluid withdrawn. It was obtained with difficulty, and contained flakes of fibrin.

Examination showed diplococci both intra- and extracellular, though in smaller numbers than at the first examination. Only one cell was seen with 3 organisms in it. Some lymphocytes were also seen; 30 c. c. of Flexner's serum was injected. In the evening he was again very delirious and required hot baths and morphine.

December 3, the next day, he answered questions rationally for almost the first time since admission. Bedside notes say, "His physical condition is rather worse this morning than at a corresponding time yesterday, but his mental condition is better." His tem-

perature was lower also. That afternoon we gave 25 c. c. more of the serum. Had I known at that time as much about the serum as I do now, I would have given 45 or 60 c. c. instead of the small amount. Examination of the fluid withdrawn showed a larger proportion of polymorphonuclears present and fewer organisms, it being rare to find a cell with a diplococcus in it. No extracellular ones were seen.

December 4. Stiffness unimproved. Mental condition better, is more quiet, pulse rate still high but of good quality. There seems to be some general improvement; 30 c. c. of serum injected. This injection was followed by a period of semiconsciousness for an hour. Before the injection he had been conscious and talking rationally, but as soon as the serum was given he relapsed into the above-mentioned condition. This was the only time we had the least ill effects from the use of the serum, and I attribute it to the fact that through inadvertence it was not warmed before injection. Examination of the cerebro-spinal fluid withdrawn showed only a few vacuolated, swollen pus cells and no intracellular organisms. A few extracellular ones were seen. His condition steadily grew better during the next few days, with the exception of his eye, the cornea of which perforated on December 5 and the iris prolapsed, although continuous treatment had been given to this eye ever since the development of the first symptoms. His stiffness had decreased, appetite was better, and the mental condition brighter. On December 5 he received 30 c. c. more of the serum. Examination of the cerebro-spinal fluid showed it to be clearer and of an amber color; pus cells relatively decreased. Organisms were rarely seen and took the stain poorly. No extracellular ones were found.

December 7. Better, except slight delirium at night; 30 c. c. of serum was injected. Organisms were fewer in number. Both extra- and intracellular ones were seen.

December 8. Thirty c. c. of serum injected. Cerebro-spinal fluid examination not noted. From now on his condition improved up to a certain point, and while he was rational and had little pain or stiffness, yet he did not gain in weight or strength. The left eye cleared up, but he had an anterior synechia. His pulse ran from 100 to 120 in spite of digitalis in various forms. Between December 25 and 30 he had a relapse, not requiring the serum, which possibly was brought on by the potassium iodide he had been receiving for a short time previously in the hope of helping absorption of the exudate.

January 1 he sat up in bed, and from then on his career was uneventful until he was discharged to duty on March 9. He was afterwards discharged from the service on account of synechia. This is the history of a case steadily growing worse in spite of recognized and rational treatment for seven days, or until the serum was used. After the first injection he was better mentally and from then on his

condition, both physical and mental, improved. He received six injections, or 175 c. c., of serum in all. The bad effects in these cases were practically nil. The temperature chart showed a steady diminution of the excursion of the fever. The record is correct, for all temperatures were taken by rectum.

CASE 3.

G. H. G., apprentice seaman, aged 17 years 3 months, native of Massachusetts. He was admitted from the brig of Barracks "B" after having been ill but a few hours. The hospital ticket said that he had pain in the back of the head and neck, and projectile vomiting. On admission he was in a semiconscious condition, from which he could not be aroused except to mutter inarticulate sounds. His restlessness was extreme and he appeared to be in great pain; his pupils were equal and reacted to light, and a purulent conjunctivitis was present. The neck was stiff and Kernig's sign was present. As soon as possible a lumbar puncture was done and about 20 c. c. of turbid cerebro-spinal fluid was withdrawn, which on examination was found to contain a large number of leucocytes, in some of which were the meningococci decolorized by Gram. His restlessness was so great as to require that the puncture be done under chloroform. This is the only time in our experience when this step was necessary, and all subsequent injections, even in this case, were done with the help of cocaine alone. We had on hand a few bottles of the serum sent to us about six months previously and I at once gave him 30 c. c. of it. This was at about 11 o'clock a. m. By 3 p. m., four hours later, his mental condition had so improved that he gave a connected account of the beginning of the illness. He was rational and complained at that time of intolerable headache in the vertex and frontal regions, and also photophobia. During the afternoon he vomited several times, the act being projectile in character. His pain was so severe on this and during successive days as to require morphine. The fluid withdrawn on this day was turbid and was found to contain a large number of pus cells, in about 30 per cent of which were seen meningococci. A few were extracellular. The organisms did not take the stain well.

The next day (June 3) he received 30 c. c. more of the old serum. The cerebro-spinal fluid withdrawn was still turbid, but fewer organisms were present and they took the stain poorly.

June 4. Puncture was done and the fluid withdrawn was found still turbid and with well staining organisms present. There was an average of one coccus to each microscopical field. These organisms were the most typical and characteristic ones found in this case, and they were more numerous than in the specimens examined before. All the fluid so far examined was withdrawn prior to any injection of

fresh serum. Examination, too, of culture growth on the 4th showed characteristic diplococci decolorized by Gram. During these days his condition was growing steadily worse, until on June 4, at noon, he was delirious, his pain was intense, the whole body was hyperæsthetic, and the head was drawn back to the spinal column. Fresh serum having arrived from Doctor Flexner on that day (June 4), 45 c. c. of it was injected. This was given at about noon. He was very restless till 4 p. m., when he received one-eighth grain morphine, after which he apparently slept till 9 p. m., at which time he awoke rational and free from pain, unless he moved. His head was much retracted, so that he could hardly swallow, and he had with it an extreme lordosis.

June 5. Mental and physical condition much improved. Says he "has no pain except behind the knees;" 30 c. c. of fresh serum given. This was almost a dry tap, for only about 10 drops of cerebro-spinal fluid could be withdrawn. This showed fewer organisms, the leucocytes were more granular and a few lymphocytes were seen.

June 6 and 7 he was better and the rigidity was much lessened, as was shown by the fact that he could move his head, also Kernig's sign was less marked. But he was still very restless and so on the latter date 30 c. c. of the serum was given. The fluid withdrawn was less turbid, the organisms were very few, and only one cell was seen with more than one meningococcus in it. The leucocytes as stained by methylene blue were fragmentary, but with Wright's stain they looked more normal, although granular. During the night of the 7th and 8th his respirations suddenly rose to 40 per minute and examination of the lungs showed pneumonia of the right lung at the angle of the scapula. Examination of the sputum was negative for *B. tuberculosis* on this and all subsequent examinations. From the 8th to the 14th he ran a typical pneumonic temperature with slight morning remissions. It ranged from 102° to 103° or 104° at night, with respirations from 32 to 35, and pulse running from 100 to 110. There were never physical signs of involvement of a whole lobe. On the 11th a similar area was found in the mid-axillary line of the left lung. During this time no serum was given, but at the same time the meningeal symptoms were gradually abating, and on the 15th Kernig's sign was gone and he was lying on his back for the first time. From the 15th to the 18th he grew gradually weaker, and on the latter date was in a typhoid state with muttering delirium, subsultus, etc. On the 15th, too, his pulse suddenly jumped from 94 to 130. After that date it never was below 112, and most of the time was around 120, and this, too, in spite of vigorous stimulation by strychnine, digitalis, etc. I have thought since that this was one of the first symptoms of pressure from the beginning hydrocephalus, shutting off the inhibitory power of the pneumogastric.

During these days forced feeding was instituted and brandy freely exhibited, sometimes being given every twenty minutes.

June 17 another injection of 30 c. c. of serum was given. As soon as the needle was introduced the cerebro-spinal fluid spurted from it under pressure and over an ounce of turbid fluid was quickly withdrawn. This fluid showed both intra- and extracellular organisms. A Gram-stained cover from the same needle and made at the same time showed no cocci at all.

The next day his temperature dropped to 99.6 by rectum, and from then on till the end it ranged considerably lower, though it never reached 98.6 but once. On June 19, 20, 21, 22, and 23, each, he received 30 c. c. of the serum, and on the 24th 15 c. c. The fluid cleared up, lost its turbidity, the organisms became fewer, but were always present, except on one occasion; it always flowed easily and from 30 to 50 c. c. could be obtained in from three to five minutes. On June 22 his respiratory rate began to go up and from then on it steadily increased until he died. This, too, was probably due to the hydrocephalus. On that day also paralysis of the throat appeared and food and water regurgitated through the nose. An exacerbation of the meningeal symptoms appeared with retraction of the head and Kernig's sign.

June 25 was characterized by two attacks of respiratory failure, requiring artificial respiration. During these attacks his heart would beat well as long as Sylvester's method was kept up, but when it was lessened the heart became worse. His condition grew gradually worse and he finally died on June 26 from failure of respiration, having been sick twenty-six days in all.

Post-mortem of head and chest was held seven hours after death: Body extremely emaciated, green discoloration across chest, little or no cadaveric lividity.

Dura not adherent, brain soft and edematous, collapsing when removed, not holding its shape. It was much injected and had in both gray and white matter minute punctate spots of hemorrhage. Lateral ventricles dilated to capacity of 1½ or 2 ounces and full of straw-colored fluid. No pus or muco-pus was seen.

Heart pale, wall of left ventricle thick, apparently hypertrophied, valves normal, right heart dilated, walls thin and pale, cavities filled with yellowish, thick, cream-colored clot.

No pleural adhesions; lungs, hypostatic congestion—left lung normal; apparently an area of resolving pneumonia in upper lobe right lung posteriorly. It is considered that he died from pressure caused by chronic hydrocephalus.

In this case the serum was given as soon as the diagnosis was confirmed and within twenty-four hours of the onset of the disease. Something (and I attribute it to the serum) cleared up his mental

condition within four hours, decreased the number of organisms, relieved the pain and stiffness, and changed the character of the infection from a severe type to that of a more or less chronic one. On the other hand, in spite of vigorous treatment thoroughly applied (he received in all 360 c. c. of serum), he finally died from the effects of hydrocephalus. On the other hand, we should remember that his was not an uncomplicated case, as he had also a pneumonia. This would in some degree modify the conclusions.

It appears, therefore, that the serum cured one of our cases and so changed the course of the disease in the other two as to prolong life, although both ultimately succumbed to hydrocephalus. In all, the serum improved certain symptoms, particularly the mental ones. Its effect on the temperature was not so marked as we had hoped to see.

There were no ill effects seen from the use of the serum. At first we thought there were some pressure effects, but as soon as we carried out the injections as directed we had no further trouble, and in the last case 45 c. c. was given at one time, with no bad results or symptoms of any kind except a complaint of pain behind the knees, which lasted about ten or fifteen minutes.

On the whole, I think I may say that the results have been much better than we hoped for in the beginning, and they certainly justify the further use of the serum in suitable cases. I wish to express here my thanks to Doctors Flexner and Jobling for their promptness in sending the serum, for their great interest in the cases, and for the many helpful suggestions they have given from time to time.

I wish also to thank Passed Asst. Surg. J. L. Neilson, U. S. Navy, for the benefit of his knowledge derived from the care of similar cases, and for help in overcoming some of the technical difficulties at first.

REPORTS ON FOUR CASES OF TUBERCULOSIS (THREE PULMONARY AND ONE PULMONARY AND GLANDULAR) TREATED BY MERCURIAL INJECTIONS.

[From Trinidad, Cuba, August 26, 1908.]

By Asst. Surg. Reynolds Hayden, U. S. Navy.

After reading Doctor Wright's article in the Medical Bulletin of April, 1908, I determined to try the treatment myself on some cases around here, if any could be obtained. With the assistance of the local sanitary officer I obtained four cases willing to submit themselves to the new treatment. At first I was able to give the mercury internally only, with not very good results, as shown in case 1. A little later, however, I obtained some hypodermic tablets of the succinimide of mercury and a hypodermic syringe for administering the same and proceeded with the hypodermic treatment as outlined

by Doctor Wright. The results were most gratifying, two cases cured, one case very much improved, and the other case, after considerable improvement, refused further treatment.

One of these cases was treated in a local hospital, but the other three were treated in their homes, showing, in my opinion, that the treatment is available for use by the regular practitioner. While under the circumstances my technique was not as good as that described by Doctor Wright, I had no abcesses in any of the cases. To the best of my knowledge and belief syphilis did not exist in any of these cases. The only other treatment received by them besides the mercury was diet and what hygienic measures I was able to induce them to carry out.

I am convinced that the new treatment is most excellent and, from what slight use I have been able to make of it down here, I think that it is very practicable.

CASE 1.

This patient had advanced tubercular lesions of both lungs. No previous history is available, but he has been under treatment at the General Wood Hospital here for four months, becoming progressively worse. He stated that he had had cough and profuse expectoration, with loss of weight, for several months before admission to the hospital.

When I first saw him patient was much emaciated, weighing 82 pounds. He had more or less continuous cough, profuse expectoration, containing large numbers of tubercle bacilli. He slept poorly. His appetite was very poor. Throat was apparently in good condition, but from his voice sounds there was probably some tubercular laryngitis present. No instruments were available for laryngoscopic examination. He also had profuse night sweats.

Height, 5 feet 4 inches; chest, inflated, 28 inches; deflated, 27 inches: weight, 82 pounds; pulse, 150; respiration, 30; temperature (evenings) ran between 38° and 39° C. continuously, sometimes reaching 40° C.

PHYSICAL EXAMINATION.

Inspection.—Patient very much emaciated; chest flat; ribs and clavicles very prominent; apices much depressed; prominent, winged scapulæ; apex beat prominent; but slight movement of chest on inspiration and expiration.

Right lung, anteriorly.—Tactile and vocal fremitus increased, especially over upper lobe and in axilla; dullness on percussion over entire upper and middle lobe and greater part of the lower lobe; auscultation gave tubular breathing over apex, upper lobe, and axilla; numerous moist râles present over the entire lung; breathing accentuated over lower part of lung and expiration prolonged; whispered pectoriloquy present—distinctly over upper part.

Right lung, posteriorly.—Dullness over entire lung, more marked in upper lobe; tubular breathing over upper lobe; harsh breathing over lower part; numerous râles throughout, especially toward apex and base.

Left lung, anteriorly.—Tactile and vocal fremitus increased; dullness over entire lung except for small area in center of upper lobe where increased resonance, a tendency toward amphoric breathing and bubbling râles indicated a small cavity; tubular breathing over upper part of lung and in axilla; bronchovesicular breathing in lower part; numerous moist râles over entire lung, more pronounced in upper lobe and in axilla.

Left lung, posteriorly.—Tactile and vocal fremitus increased; tubular breathing over upper lobe, roughened breathing over lower lobe; dullness over entire lung except a patch in upper part of lower lobe; numerous râles throughout.

Heart.—Rapid, but the sounds were good and clear.

Glandular system.—Normal.

At this time, having no hypodermic syringe for mercurial injections, I started the patient on hydrargyri chloridi corrosivi, gr. $\frac{1}{16}$, and potassii iodidi, gr. 10, in compound tincture of gentian three times a day.

Patient responded but slightly. I then increased the hydrargyri chlor. corros. to gr. $\frac{1}{8}$ and then to gr. $\frac{1}{5}$ T. I. D. Patient responded slowly, expectoration and cough decreased somewhat and temperature dropped gradually, as per appended chart. Patient then became salivated and had a profuse diarrhoea. Mercury was stopped and KI continued. This treatment was begun May 24, 1908, and discontinued June 3, 1908, patient showing the physiological symptoms of the drug in eleven days.

On June 11, 1908, I obtained a hypodermic and needle for mercurial injections and hypodermic tablets of hydrargyri succinimidum, and started injections at once, gr. $\frac{1}{10}$ every other day.

Improvement was at once noticeable. The temperature dropped to normal in two days and stayed there. Cough and expectoration was diminished and night sweats ceased. Patient's appetite increased and he became able to walk about the room by himself, in about ten days, something that he had not been able to do for about a month.

Injections were increased to gr. $\frac{1}{5}$ of hydrargyri succinimidum every other day and improvement continued as follows:

CLINICAL NOTES.

May 25. Doing poorly; weight, 82 pounds; temperature, same.

May 30. Slight improvement; temperature (evening), 38° C.; otherwise no better; bichloride gr. $\frac{1}{5}$ T. I. D.

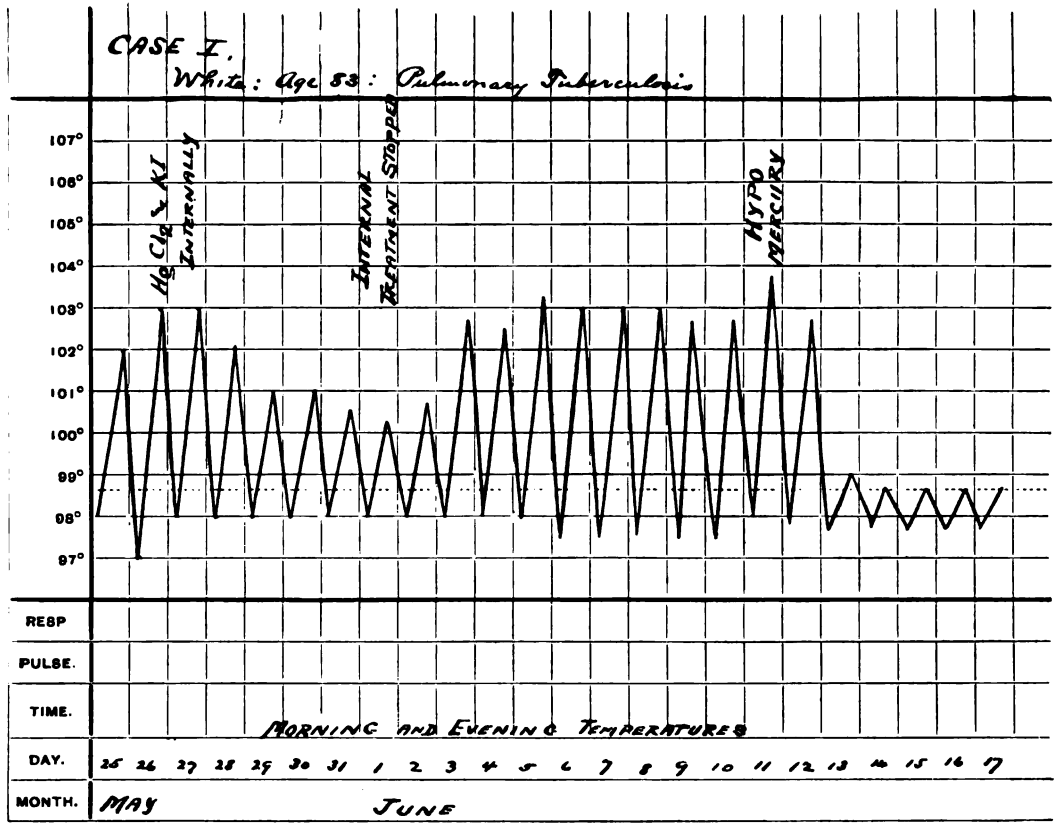
June 3. Salivated; mercury stopped; KI continued.

June 11. Hypodermic of hydrargyri succinimidum gr. $\frac{1}{10}$ every other day; general condition about the same as before treatment.

June 18. Marked improvement; no fever or night sweats; cough and expectoration diminished; weight, 85 pounds; appetite much better.

June 25. Continued marked improvement; patient is able to walk about room; cough and expectoration continue to diminish; bacilli in sputum scanty; appetite remains good and temperature continues normal; weight, 90 pounds; hypo. increased to gr. $\frac{1}{5}$ every other day.

July 1. Improvement continues; patient is much stronger and is now able to walk about the hospital yard; cough very slight and râles have practically disappeared


CASE I.
White: Age 53: Pulmonary Tuberculosis
107°
106°
105°
104°
103°
102°
101°
100°
99°
98°
97°
$HgCl_2$ & KI INTERNALLY
INTERNAL TREATMENT STOPPED
HYPO MERCURY
RESP
PULSE.
TIME.
MORNING AND EVENING TEMPERATURES
DAY.
25 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
MONTH.
MAY
JUNE

from both lungs; sleeps well at night; weight, 94 pounds; patient is much more interested in his surroundings; his pulse is better, 88, and he feels much stronger; voice normal.

July 8. Improvement continues; weight, 97 pounds; patient started on lung gymnastics; hypo. increased to gr. ⅗ every other day.

July 15. Improvement continues; in good weather, patient remains out in the yard most of the day; is in very good condition for man of his age, 83; chest expansion, inflated, 28¾ inches; few bacilli still in his sputum; weight, 100 pounds.

July 22. Improvement continues; no T. B. found in sputum; lung, expanded, 29¼ inches; only occasional cough and few râles; weight, 102 pounds; impaired resonance absent over lower part of both lungs.

July 29. Patient in very good condition for man of his age; is able to walk about without aid of stick, but prefers to have it; temperature continues normal; weight, 105 pounds.

August 5. Patient's lungs are now in very good condition; expansion of 2½ inches; lungs are apparently normal except for prolonged expiration and roughened breathing over left upper lobe anteriorly; weight, 107 pounds.

August 12. Patient allowed to go home at his own request; lungs normal with exception of slightly increased fremitus over left apex and somewhat prolonged expiration over same; percussion normal throughout; weight, 111 pounds.

August 19. Patient returned to hospital every other day for treatment; to-day injections were discontinued and patient given hygienic advice; lungs appear about normal; weight, 115 pounds.

Comment.—In this case, the patient was given up for dead by his relatives, friends, and the hospital staff. When the mercurial treatment was begun, he was bedridden and the attending physician prophesied his death within a month.

He improved gradually under the bichloride, but before any marked improvement had been made, the physiological effects of the drug showed themselves, necessitating its stoppage.

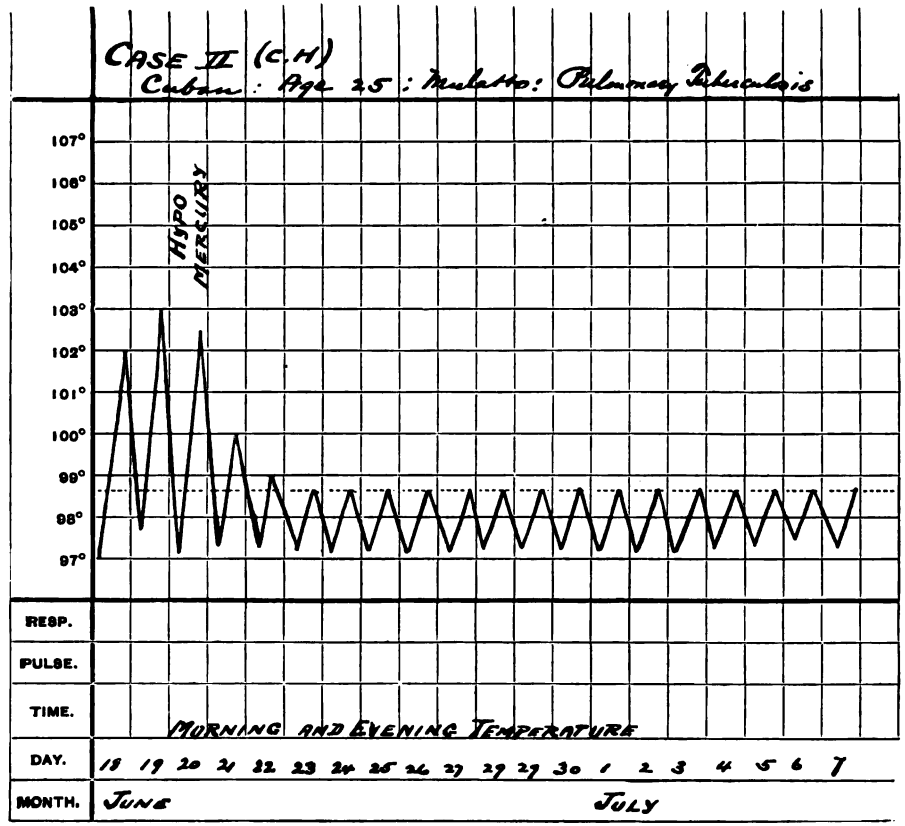
Eleven days later, hypodermic injections of the succinimide of mercury were begun, he having recovered from the physiological effects of the bichloride.

His condition immediately began to improve and continued; fever and night sweats departed never to return; cough and expectoration diminished; appetite and weight increased.

At the time of his discharge, his lungs were apparently normal, he had a good appetite, was able to walk around by himself, and said that he felt better than he had felt for several years. While not strong, his condition was very good for a man 83 years old. He now weighs 115 pounds, a gain of 33 pounds in a little over two months, and I expect him to continue well.

CASE 2

Patient has suffered from cough, expectoration, night sweats, loss of weight, and appetite. Patient states that about ten months ago he began to have a persistent, hacking cough. He at first paid but little attention to it, but later, about four months ago, February, 1908,


CASE II (C.H)
Cuban : Age 25 : Mulatto : Pulmonary Tuberculosis
107°
106°
105°
104°
103°
102°
101°
100°
99°
98°
97°
HYPO MERCURY
RESP.
PULSE.
TIME.
MORNING AND EVENING TEMPERATURE
DAY.
18 19 20 21 22 23 24 25 26 27 29 29 30 1 2 3 4 5 6 7
MONTH.
JUNE
JULY

Left lung, posteriorly.—Tactile and vocal fremitus increased throughout: dullness as low as the seventh dorsal vertebra, and below this impaired resonance: tubular breathing and numerous moist râles throughout.

Pulmonary summary.—The right lung appears consolidated from apex to nipple and appears to have considerable involvement below this. Posteriorly the apex and upper lobe are consolidated and a small patch at the base. The remainder of the lung appears to be actively infiltrated.

The left lung appears to be almost entirely consolidated and has a medium-sized cavity beneath the second rib in the upper lobe.

CLINICAL NOTES.

July 10. Hypodermic injections of hydrargyri succinimidum every other day started, gr. $\frac{1}{10}$.

July 17. Evening temperature to-day higher than yesterday and hypodermic dose of succinimide increased to gr. $\frac{1}{4}$.

July 19. Evening temperature, 37.2° C.; somewhat better.

July 22. Patient improving; temperature continues normal; night sweats stopped, but cough no better.

July 25. Improvement continues; temperature continues normal: cough and expectoration a trifle better; weight, 88 pounds, a gain of 4 pounds; hypodermic injection of succinimide increased to gr. $\frac{4}{10}$ every other day; patient complains of pain of injections.

August 1. Considerable improvement; temperature remains normal; appetite much better: sleep somewhat improved, but cough and expectoration not much better; weight, 96 pounds, a remarkable gain—8 pounds in the week; patient continually complains of pain of injections.

August 4. Patient declines further treatment. His condition has been considerably improved. He is 12 pounds heavier, feels stronger, has a much better appetite, and no more fever or night sweats. He declines further treatment, however, saying that he can not stand the pain of further injections.

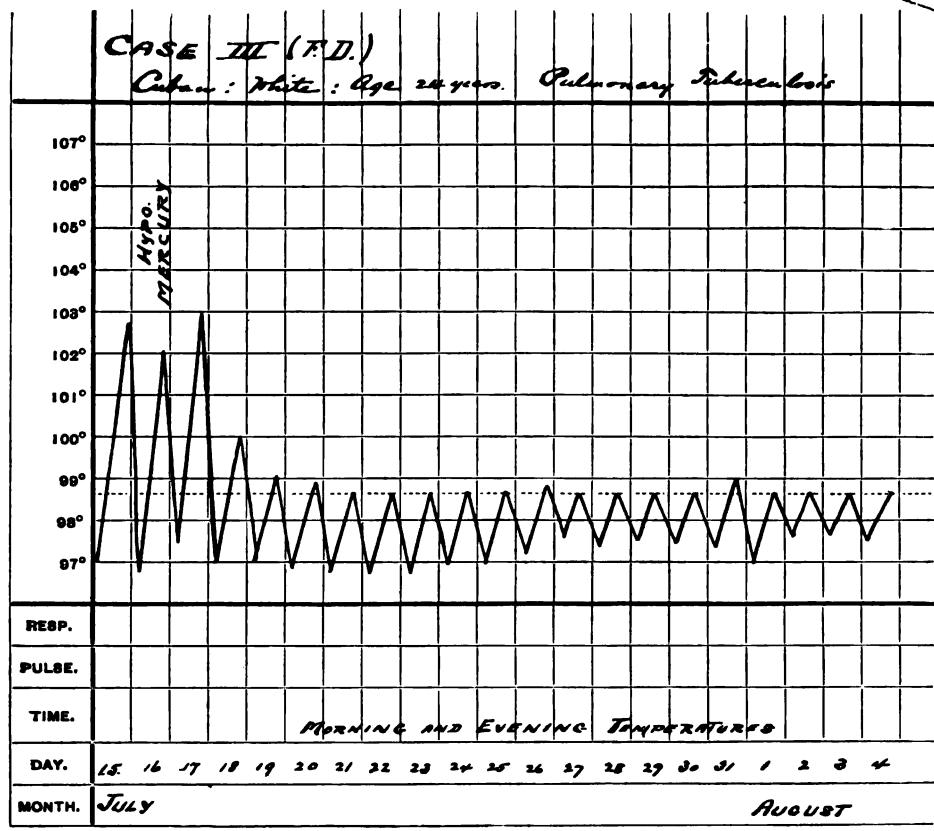
Comment.- In this case the patient had advanced tuberculosis of both lungs, especially the left. During the three weeks that he was under treatment he showed considerable improvement, feeling stronger, gaining 12 pounds, and having a much better appetite, no fever or night sweats.

It is a great pity that he declined further treatment, as I believe that he would have finally gotten well.

I saw him August 21 and he had begun having a rise of temperature in the evening again, while his weight had fallen off to 93 pounds, a loss of 3 pounds since stopping treatment.

CASE 4.

Boy aged 15, who has suffered from pulmonary tuberculosis for something over a year. Family history negative so far as I could ascertain. He was brought here from another town to obtain what benefit he could from the higher altitude here.


CASE III (F.D.)
Cuban : White : Age 24 years. Pulmonary Tuberculosis
107°
106°
105°
104°
103°
102°
101°
100°
99°
98°
97°
HYPO. MERCURY
RESP.
PULSE.
TIME.
MORNING AND EVENING TEMPERATURES
DAY.
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4
MONTH.
JULY
AUGUST

When first seen by me his condition was noted as follows:

Very much emaciated, weighing 55 pounds; was listless, coughs continually with profuse expectoration; very poor appetite; sleeps poorly, sleep being frequently interrupted by paroxysms of coughing; profuse night sweats; temperature, according to boy's father, who had a thermometer, had ranged around 39° C., evening temperature for some time; pulse, 150; respiration, 30; weight, one year ago, 80 pounds; present weight, 55 pounds; chest circumference, inflated, 24 inches; deflated, 22½ inches; tubercle bacilli numerous in the sputum.

PHYSICAL EXAMINATION.

Inspection.—Poorly shaped chest; pale, much emaciated; ribs and clavicles very prominent; scapulæ prominent; apices depressed; enlarged sterno-mastoid and submaxillary glands on both sides, probably tubercular.

Right lung, anteriorly.—Increased tactile and vocal fremitus, especially over the upper lobe; dullness over upper lobe and impaired resonance over lower; distinct tubular breathing over apex and upper lobe, carried into axilla; broncho-vesicular breathing over good part of lower lobe; moist and bubbling râles throughout upper lobe; whispered pectoriloquy over apex and upper lobe as far as third rib.

Right lobe, posteriorly.—Increased tactile and vocal fremitus over upper lobe and small area in base; dullness over upper lobe; somewhat impaired resonance over base; tubular breathing over apex and suprascapular region; roughened breathing with prolonged expiration and a few dry râles at the base; numerous moist râles over apex and upper lobe.

Left lung, anteriorly.—Increased tactile and vocal fremitus over upper lobe; dullness over upper lobe with the exception of a small area where there was hyper-resonance; vocal fremitus slightly increased over lower lobe; impaired resonance over small patch in lower lobe; tubular breathing over apex, greater part of upper lobe and axilla; at one place, corresponding to the area of hyper-resonance, there was a suggestion of amphoric breathing, suggesting cavity; whispered pectoriloquy over apex and as far down as second rib; moist and bubbling râles over entire upper lobe and a few small moist râles in lower lobe.

Left lung, posteriorly.—Tactile and vocal fremitus increased over apex and suprascapular region; dullness and tubular breathing over same; remainder of lung posteriorly apparently normal with the exception of some râles in the axilla.

Pulmonary summary.—Both lungs are involved in the upper part and the right lung throughout, but in the lower part of the left apparently none. Expansion is deficient throughout, the lower lobe of the left lung being in the best condition.

Patient was started upon hypodermic injections of hydrargyri succinimidum, gr. ⅛, at first every third day and then every other day. Improvement began immediately and continued until now, as per following record:

CLINICAL NOTES.

July 29. General condition poor; profuse cough, expectoration, and night sweats; sleep and appetite very poor; hydrargyri succinimidum, gr. ⅛ by hypo.

August 1. Marked improvement; temperature normal to-day; night sweats ceased; appetite better; hypodermic injection of hydrargyri succinimidum, gr. ⅛ every other day.

August 5. Improvement continues; temperature remains normal; cough and expectoration decreased; sleep better; appetite continues to improve; weight, 59 pounds; pulse, 135 and stronger; glands decreased in size.

August 12. Condition much better: temperature continues normal; pulse, 120; color much better; cough and expectoration much decreased; bacilli scantier in sputum; weight, 65 pounds; no râles heard over lower part of right lung, and much diminished over upper lobes of both lungs; tubular breathing decreased; patient complains of some pain from injections.

August 19. Patient continues to show marked improvement; takes more interest in life; sleeps well; appetite very good; weight, 70 pounds; patient is noticeably heavier and stronger than he was; few bacilli in sputum; cough and expectoration much decreased; chest expansion, 2¼ inches; temperature continues normal; glands almost normal in size.

August 21. Improvement continues; glands normal; very little cough or expectoration; very hard to find bacilli in sputum.

August 24. Doing finely.

PRESENT CONDITION.

Feels very much better; appetite good; sleeps well; cough and expectoration much decreased and now most marked in morning after getting up; temperature ranges between 36.5° and 37° C.; pulse between 90 and 100; respiration, 24; chest inflated, 24¾ inches; deflated, 22¼ inches.

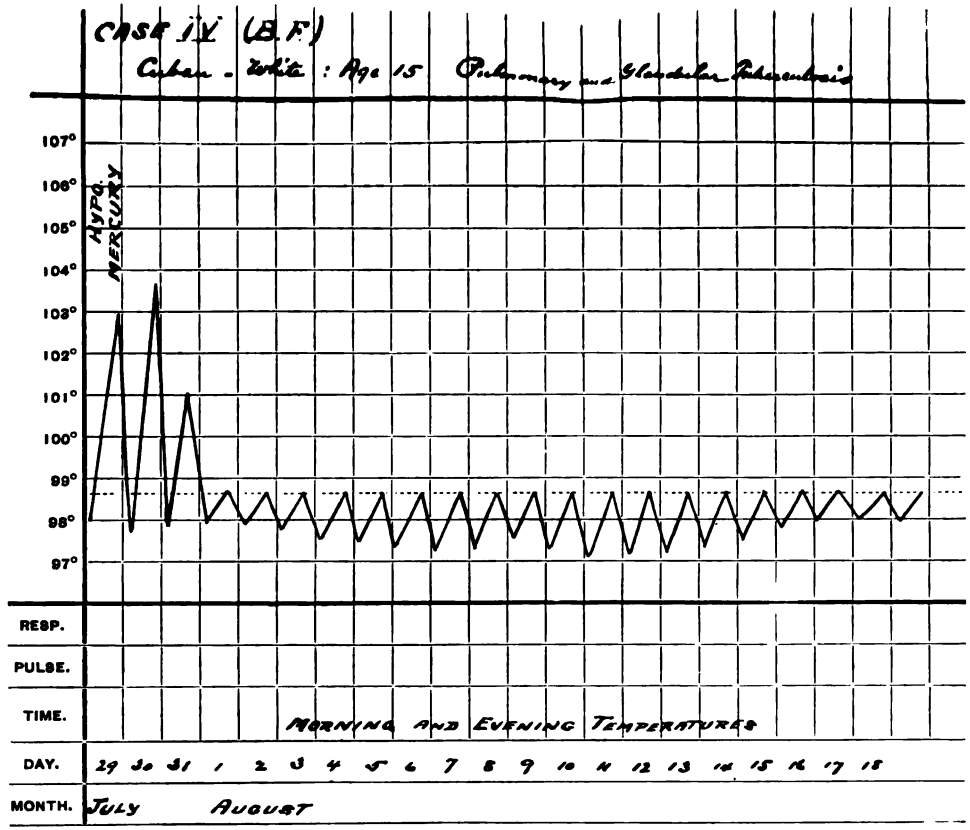
Inspection.—Apices slightly depressed; ribs and clavicles but slightly prominent; patient still somewhat thin.

Right lung.—Impaired resonance to third rib anteriorly and in suprascapular region posteriorly; vocal fremitus increased over same area, but tactile fremitus negative; bronchial breathing over apex; roughened breathing to second rib anteriorly and in suprascapular region posteriorly; expiration slightly prolonged to fourth rib; pectoriloquy absent.

Left lung.—Vocal fremitus increased over apex; tactile fremitus negative; impaired resonance above clavicle; broncho-vesicular breathing over apex, with roughened breathing and slightly prolonged expiration to second rib and in axilla; dullness posteriorly in suprascapular space; pectoriloquy absent.

Comment.—Before mercurial treatment was begun patient was in quite bad condition, but immediately following the injections he began to show marked improvement. Temperature became normal; night sweats stopped; cough and expectoration decreased; bacilli became scanty in the sputum; appetite and sleep became excellent. His weight increased 16 pounds in the time that he has been under treatment, four weeks. Patient has become much stronger and his color much better. Both lungs are markedly improved and the enlarged glands of the neck have become normal in size.

The improvement in this case in such a short space of time is most gratifying and I now have not the slightest doubt of his getting well. In addition to the marked improvement in his lungs, the enlarged tubercular glands in his neck have become normal in size.


CASE IV (B.F.)
Cuban - White : Age 15 Pulmonary and Glandular Tuberculosis
107°
106°
105°
104°
103°
102°
101°
100°
99°
98°
97°
HYPO. MERCURY
RESP.
PULSE.
TIME.
MORNING AND EVENING TEMPERATURES
DAY.
29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
MONTH.
JULY
AUGUST

NOTES ON FOUR CASES OF CHRONIC PANCREATITIS TREATED BY DRAINAGE OF THE GALL BLADDER.

By Surg. H. C. CURL, U. S. Navy, and Passed Asst. Surg. H. W. SMITH, U. S. Navy.

The following cases of pancreatitis are reported because such are found not infrequently in the personnel and because of the great advances recently made in our knowledge of the disease. Mayo Robson, Cammidge, Moynihan, Mayo, and others have contributed to our clinical and operative knowledge, and contrary to what is frequently the case in newly investigated affections, all seem agreed as to symptomatology and treatment. (See U. S. Navy Bulletin, vol. 2, No. 3. July, 1908, pp. 62, 79, et seq.)

The close relation borne by the Cammidge reaction to the condition of the pancreas is interestingly shown in our small series.

CASE 1.

(A. O. W.). No. 204. September 6, 1907.

Present illness.—Recently patient has lacked energy. Two months ago he became jaundiced, his urine being dark and his stools clay colored. He continued at duty until two weeks ago. After a meal of solids he has pain of short duration and sour eructations; he has never vomited or coughed up blood. Pain starts in epigastrium, follows right costal margin and shoots to right scapula; it is sharp and after a brief paroxysm dies away. Pain is generally independent of food.

On September 8, while patient was at stool, he vomited about 400 c. c. of fresh clotted blood.

September 9. Operation (ether—right rectus incision): Liver was found to be enlarged, and the gall bladder greatly thickened and distended. Bladder was aspirated, and a searcher was passed to common duct. Common duct was palpated and no stones felt. Other organs, including pancreas, were apparently normal; gall bladder drained.

After operation the jaundice slowly disappeared and the patient gained weight, but the stools remained clay colored and fat digestion was imperfect.

On November 22 the urine showed the Cammidge reaction, and on December 16 sugar in the urine was found for the first time, though constantly thereafter.

A cholecystenterostomy was advised, but refused by patient, and he was lost sight of. He has since died, but no further data are obtainable.

CASE 2.

(R. C. D.). No. 468. March 17, 1908.

Personal history.—In 1904, while in the Philippines, there occurred six attacks, some weeks apart, of pain localized about the umbilicus and "accompanied by enlargement of the liver and spleen."

Present illness.—In November, 1906, an ache appeared in the right flank. Stools at this time were frequent (4 to 6 daily), copious, offensive, light in color, and floated in water; they were not frothy, greasy, or sour. Feces were said to contain much undigested fat and the blood to contain an excess of lymphocytes. During June, 1907, patient was on a milk diet. Flatulency became troublesome, and stools continued light and somewhat frothy. Temperature was normal; weight, 30 pounds below usual habit; has never been jaundiced.

Condition on admission.—Digestion: Described as good; mouth and tongue not sore, but tongue has shown a white fur for two years. Of late he has had some belching of gas during and after meals. He avoids starches and tea and coffee. Stools: Two daily, usually unformed, and (after attacks of pain) light yellow in color, mucilaginous and offensive. Some stools float. Pain: There is discomfort amounting to an ache always; this becomes severe at irregular intervals. Such a period may last two days and, during one, the stools become gray. Afterwards both urine and feces become dark. Pain is on the right side, usually at the eighth costal cartilage, sometimes in the flank or lower abdomen. Pain is constant and of even intensity, not boring or radiating or cramp-like.

Physical examination.—Not jaundiced; liver extends from fifth space to costal margin; edge feels normal; rarely a slight tenderness can be elicited over gall bladder; gall bladder not palpable. In epigastrium there is strip of tenderness extending transversely 4 cm. on either side of the middle line and located 5 cm. above umbilicus. A slight doughy resistance crosses aortic pulsations at site of tenderness; spine negative. Blood: Hgb. 95 per cent. White cells, 7,500. Polynuclears, 51 per cent. Lymphocytes, 43 per cent. Feces show no ova or protozoa. Urine showed a positive (Cammidge) pancreatic reaction on three successive days; no sugar present.

Operation (ether—vertical incision through right rectus): Bile ducts and gall bladder explored for calculi; none found. Upper abdomen was negative, except for pancreas. The head of the pancreas was somewhat enlarged, firm, and contained areas of induration. Cholecystostomy was performed with Mixter tube. Bile was sterile.

Convalescence was uninterrupted. Cammidge reaction had disappeared nine days after operation.

A diet of eggs, modified (soured) milk, and selected vegetables was continued for seven weeks. At this time there was apparently a complete return to normal conditions, and the drainage was consequently suspended, the fistula allowed to close, and the patient returned to full diet. At the time of his discharge, eleven weeks after

FIG. 1.—MIXTER TUBE, FOR DRAINING GALL BLADDER AFTER CHOLECYSTOSTOMY, IN SITU. DRAWING OF MIXTER TUBE (ACTUAL SIZE) IN LOWER RIGHT CORNER.

operation, the urine showed no Cammidge, and there was no return of the symptoms. Cammidge reaction is now absent, six months after operation.

CASE 3.

(E. C. E.). No. 498. April 27, 1908.

Personal history.—During 1906, while serving in the Philippines, patient had attacks of abdominal pain and copious stools in which there was poor digestion of fats and starches.

Present illness.—For some months there have been attacks of a different nature, occurring frequently, but irregularly and without relation to food. The pain is situated over the gall bladder and radiates to right scapula. Tenderness is located over gall bladder. There has never been jaundice or fever. Analysis of gastric contents showed good motility and digestion and slightly diminished HCl.

Repeated examinations of the urine show an occasional slight Cammidge reaction, and sugar has been present on two occasions. Feces contain flagellates (Lamblia) and Amebæ.

Operation (ether—vertical incision through right rectus): On palpation of abdominal contents, a large stone was felt embedded in cystic duct, and the pancreas was moderately enlarged and firm, the abdomen being otherwise negative. On opening the gall-bladder, one small stone was found in the clear mucoid contents. The stone felt in the cystic duct was settled at the junction with the common duct and could not be moved. The duct was then incised and the calculus removed. The calculus completely occluded the duct, and the mucous membrane had grown into the irregularities of its roughened surface. The stone was 10 by 13 mm. in diameter. A Mixter tube was fixed in the gall bladder and a rubber tube in the common duct. Bile was sterile. Bile drained from the duct for several days, and tube was then removed. Five days after operation bile appeared in the bladder drainage tube. Cammidge disappeared three weeks after operation. A modified milk diet was maintained for six weeks.

Patient was discharged free from symptoms.

CASE 4.

(E. S.). No. 566. June 12, 1908.

Personal history.—When 11 years old patient began to have attacks of gastro-intestinal disorder occuring about once a month. The attacks were characterized by slow onset, dull pain not localized, nausea, and vomiting. Stools at these periods were light in color. These attacks continued irregularly and with decreasing frequency up to recently. While under treatment in May, 1908, painless jaundice appeared and remained visible for two weeks. Jaundice appeared in June and caused his readmission to hospital.

When admitted, patient was well nourished and moderately jaundiced, with slight tenderness in abdomen above umbilicus. Physical examination was otherwise negative. Blood: Coagulation time averaged 4 minutes (25 per cent increase over normal controls); leucocytes, 10,000; polynuclears, 79 per cent; lymphocytes, 19.5 per cent. Urine contained bile, a trace of sugar, and gave a positive pancreatic reaction. Stools were composed mainly of undigested fats.

Operation (ether—incision through the right rectus): Exploration of bile ducts and upper abdomen was negative except that pancreas was large and abnormally firm. Cholecystenterostomy performed with Mixter tube for continued drainage. Bile was sterile.

After operation jaundice cleared up rapidly, and two weeks after operation sugar had disappeared from urine and the Cammidge reaction was much less marked. Three weeks after drainage was established the Cammidge had disappeared. Patient remains well, three months after operation.

A CASE OF LUPUS OF THE PENIS; SUCCESSFULLY TREATED WITH TUBERCULIN.

(Reported from U. S. S. Yorktown.)

By Asst. Surg. R. S. LANGABAUGH, U. S. Navy.

In looking back over the cases which were treated last quarter I find one that is very interesting to me for two reasons—first, it shows that the differential diagnosis is difficult between syphilis and tuberculosis when the lesion is on the penis; second, it shows the great value of tuberculin in the treatment of local lesions if they are tubercular.

On October 1, 1906, C., G. M., F. 1 cl., U. S. Navy, was received on board from the U. S. S. *Marblehead*. He had in his early life been circumcised. There was an ulcer on his penis and he was receiving gm. 1.5 potassium iodide three times daily, besides a mercurial inunction. The ulcer received careful local treatment. On February 23, 1907, the journal contains note that he now receives corrosive chloride of mercury 0.002 gm. and potassium iodide 0.5 gm. three times daily, the ulcer still persisting. On October 6, 1907, there is an admission for gonorrhea followed by orchitis. This apparently healed, but the original lesion still continued.

On November 22, 1907, when I reported on board, C. was getting potassium iodide gm. 4.6 three times a day besides mercury inunction and calomel dressing to the ulcer. I tried various dry and moist dressings and ointments and later discontinued medication internally. The ulcer now completely encircled the penis, involving

chiefly the fold of skin behind the corona, but in three places had crept up on the glans. The edges were slightly raised and the tissue beneath considerably indurated.

I concluded that if more than two years of careful treatment with full doses of antisyphilitic remedies would not at least stop the progress of the condition, it surely was not luetic, and accordingly made the diagnosis of lupus. Surg. Manley F. Gates, of the U. S. S. *Charleston*, saw the condition and after a study of the history concurred in the diagnosis of lupus.

I resected the ring of diseased tissue and as much of the indurated tissue as was possible and brought the apparently healthy edges together. Pus developed and the condition looked worse even than before. He now had an evening temperature of 99° F. On April 20, 1908, he received subcutaneously 0.000001 gm. T. R. On April 28, 1908, his condition was better, temperature normal, the pus was disappearing and induration lessening. The dose of tuberculin was repeated. Following this the part healed completely and the induration rapidly decreased. On May 12, 1908, the dose was again repeated and he was discharged from the service for expiration of enlistment.

The result was ideal. Practically all induration gone. Reports received through his shipmates say that the part remains perfectly healed and that he has reenlisted.

CURRENT COMMENT.

[It is to be remembered that in the publication of these comments the Bureau does not necessarily undertake to indorse the opinions expressed, but will lend the pages of this section to discussion of such contemporary topics as will be of interest and value to the service.]

A REVIEW OF THE SUBJECT OF "ORGANIZATION OF THE MEDICAL DEPARTMENT (NAVAL) FOR BATTLE."

By Medical Inspector H. G. BEYER, U. S. Navy.

Doctor Beyer was directed by the Surgeon-General to review the reports which had been received from ships on the above subject and to submit suggestions for improvement in organization as contemplated in the Bureau's Annual Report for 1907. The following report is the result of the preliminary review:

For a standard of comparison I have used the instructions to be found in the Manual for Ship and Gun Drills. This manual, under the head of "organization of the Medical Department in battle," states (1) that a definite plan is impossible for each ship, and (2) that such organization should be marked out for each ship, as soon after going into commission as practicable and should provide for relief stations and surgeons' dressing stations.

The lack of directions and the absence of definitions in the manual leave, of course, the doors wide open for a great variety of plans in general organization and in establishing the required relief and dressing stations, even on ships of the same build and type.

Considerable confusion seems to exist in the minds of medical officers as to what organization means, what relief and dressing stations are intended for and of what they should be made up. Their number, location, personnel, and equipment vary quite considerably on the different ships from which the reports have been examined.

It has seemed to me, nevertheless, proper, as long as the directions in the manual stand unrevived and uncorrected, that they should serve as our guide and that every medical officer in the service in organizing his department for battle should make his plans in accordance with these directions so far as practicable. It was for these sound reasons that they were used in this study as the standard by which some of the shortcomings in the reports under consideration were judged.

I. Instruction to Men.

The instructions in first aid to the men on board ships has at all times been recognized as a duty of the greatest importance. The Manual for Ship and Gun Drills (art. 27, par. 5) says: "So far as practicable, all members of the ship's company will be instructed by the medical officer in applying the first-aid dressing," and article 96, paragraph 279, speaks of the great importance of the instruction of all men in the precautions to be observed in the handling and care of the wounded.

In a letter from the British Admiralty (circular letter, Admiralty S. W., May 24, 1905, Office Naval Intelligence, Register No. 08/116) it says: "With the view of rendering first aid, a large percentage of nearly all ratings are instructed in its method and bags containing dressings, bandages, tourniquets, etc., are distributed in different parts of a ship, e. g., in each barbette, turret, casemate, conning tower, in the engine room and stokehold, so as to be readily avialable when needed."

In the German navy (letter, dated March 4, 1908, to Office of Naval Intelligence, Washington, D. C.) it says, with reference to the same subject: "Besides sick carriers, all men, but the gun crews especially, and officers employed on the upper deck, are instructed in the principles of first aid and transportation of the wounded." Similar regulations exist in the French and Italian navies.

Thus it will be seen that, in so far as concerns the subject of the instruction in first aid to be given to the men, there exists hardly any disagreement on the part of any of the foremost and the most progressive navies of the world. It becomes, therefore, of great interest to know what is the present status with regard to this part in battle—organization—in the United States Navy.

As the result of an examination of the reports from the 25 ships, it is found that nothing is said as regards instruction being given to the men in 15 ships, 60 per cent; that there is limited instruction in 5 ships, 20 per cent; that there is instruction given to the whole crew in 5 ships, 20 per cent; in all 25 ships, 100 per cent.

In the 25 reports of ships and cruisers we find, therefore, in brief, that the instruction (in accordance with the letter and the spirit of the manual) to the men is given only in 5 of the 25 ships of which the reports were examined.

II. Relief Stations.

The manual is, unfortunately, a little indefinite in its description of relief stations. All it says with reference to their location is "that such stations should be established at various protected points about the ship, in the neighborhood of and accessible to the men

who are most exposed." One of the reports even states that no relief stations could be established on account of there being no such protected points on the ship as are required by the manual. With regard to the personnel, however, the manual plainly states that "at least four well-instructed men should be assigned to each station;" that these men should report to the medical officer and should have no other duty to perform in action.

Among the 25 ships from which the reports were examined there are 8 (32 per cent) which either have no such stations at all, or which have not been described as such, or which are represented merely by one man and a stretcher.

(a) NUMBER OF STATIONS.

	Ships.	Per cent.
Having one relief station	2	8
Having two relief stations	5	20
Having three relief stations	3	12
Having four relief stations	3	12
Having five relief stations	2	8
Having six relief stations	1	4
Having eight relief stations	1	4
	25	100

(b) LOCATION OF RELIEF STATIONS.

No definite location assigned	5	20
On bridge deck exclusively	1	4
On berth deck exclusively	2	8
On splinter deck exclusively	2	8
On gun deck exclusively	8	32
On gun and main decks	4	16
On gun, main, and bridge decks	1	4
On berth and splinter decks	1	4
On bridge, berth, and splinter decks	1	4
	25	100

(c) NUMBER OF MEN PER STATION.

Number of men not stated	13	52
One man per station	3	12
Two men per station	3	12
Three men per station	1	4
Four men per station	4	16
Eight men per station	1	4
	25	100

(d) PERSONNEL, DERIVED FROM.

Hospital corps exclusively	4	16
Hospital corps and reserve gun crews	7	28
Pay division exclusively	2	8
Bandsmen exclusively	1	4
Marines exclusively	1	4
Medical officers, hospital corps, and gun crew	2	8
Not definitely stated	8	32
	25	100

(*e*) *Equipment.*—From the reports under examination, it is difficult and even impossible to arrange the equipment systematically. Very few of the reporters give an accurate and satisfactory list of things that would seem to be necessary in a relief station, while a few officers give such a long and complete list as to strongly suggest the theoretical rather than practical character of it. No uniformity whatever exists, and every medical officer seems to have a different idea of it.

In the circular letter from the British Admiralty (loc. cit.) no mention is made of either relief or transport stations, nor is any mention made of manning such stations.

In the letter from the German Navy Department (loc. cit.) it states that every transport station (the equivalent of relief station) has 4 sick carriers, and for every ship with a complement of 600 there must be provided at least 16 carriers. At this rate, each one of our large battle ships and cruisers, during war, would have to be supplied with at least 32 sick carriers. The rating of sick carriers in the German navy is that of seamen. With regard to the selection of these men, it is required that, if possible, one-half of them be professional seamen. The letter distinctly states that ammunition men, cooks, waiters, buglers, men of the administration personnel, signal and navigation men, who, during the intervals in the action and after the action is over, are indispensable at other points, should not be detailed as sick carriers.

In German ships the transport stations are, as a rule, established at a place where it is possible to lower the wounded from the upper decks, in a vertical sense, on to the lower spaces of the ship. Ladders and hand rails, as far as they interfere with transportation, are removed. The transport stations serve at the same time as assembling places for those who are wounded on the different decks. Their number depends on the size of the ship; as a rule, there are two—one fore and one aft—on a deck. The almost exclusive means of transport on German ships is the "transport hammock;" sometimes the "transport chair" is used.

In the French navy, the "Postes Secondaires" are what we call our relief stations; they are located in places that are, though not under armor protection, as sheltered as possible. Since it is at these places that the wounded are assembled and where hammocks and dressings are at hand to prepare the wounded for lowering they are more of the nature of the German transport stations than of our relief stations.

In almost every navy the gun-crew men play a certain part in the handling of the wounded. Our Manual states (p. 280) that the wounded men are laid to one side by members of the gun crew. In the British navy (loc. cit.) no removal of wounded is attempted beyond their being put out of the way of the gunners by gun-crew men.

The German letter states that the removal of the wounded from the place where they fall is done by any member of the crew, trained in the performance of that duty.

III. Dressing Stations.

The Manual for Ship and Gun Drills (art. 98, pp. 280–281), states "The surgeons' dressing station should be easy of access from all parts of the ship; should have an abundant supply of water close at hand; should be behind armor or other protection; and should be well ventilated and as cool as circumstances will permit * * * it may be advisable to establish two dressing stations, so that the surgeons can go from one to the other, work being prepared at one while the other is in use."

Of the 25 ships examined, the number, location, personnel, and equipment follow:

(a) NUMBER.

	Ships.	Per cent.
Impossible to make out, if any	3	12
One dressing station	3	12
Two dressing stations	17	68
Three dressing stations	1	4
Six dressing stations	1	4
	25	100

(b) LOCATION.

On the berth deck	21	84
On the gun deck	1	4
Impossible to make out, if any	3	12
	25	100

(c) PERSONNEL.

Medical and hospital corps men exclusively	18	72
No mention made	3	12
Medical, hospital corps, and crew	4	16
	25	100

(*d*) *Equipment.*—The equipment differs for every ship, and is therefore impossible to tabulate.

The circular letter from the British Admiralty (loc. cit.) states that "the two distributing stations are located, one forward and one aft, beneath the protective deck. (A distributing station is the equivalent of one of our dressing stations.) Each one is fitted with a cupboard to hold dressings, utensils, etc., and has a water sterilizer connected with the main steam pipes. Positions are also marked off for the stowage of medicine chests, field chests, X-ray apparatus, operating tables, basin and basin holders, instrument trays and tables, solution jars for antiseptics, etc. This material is equally divided between

the two positions, so that in the event of one portion being destroyed the other part would be available."

In the letter from the German Navy Department (loc. cit.) it says "that the action dressing stations (the equivalents of our dressing stations) should be located under armor protection and in cool places, of easy access. They should be entirely separated from one another, one forward and one aft. The neighborhood of the conning bridge should be avoided. The rooms should be entirely isolated from the other parts and duties of the ship when cleared for action. Any auxiliary machinery, etc., by the working of which the surgical work would be disturbed, must not be situated in these stations.

"As minimum of space, a fore and aft area of 18 feet and athwartships area of 13 feet is required; to this must be added a gangway of a width of 4½ feet, at least, situated, if possible, fore and aft. Near the action dressing stations and of easy access to them, there must be protected and well-ventilated rooms for bedding the wounded (storing rooms). Altogether, there should be provided berthing places for at least 10 per cent of the complement. The action dressing stations must have ample electrical illumination; for each 12 square feet, one cargo lamp with six lights; the connections should be distributed on two circuits; they should have good ventilation.

"They should be connected with the drinking-water pipe, installed under armor protection; in anticipation of a possible interruption in the drinking-water supply, water tanks should be provided in each dressing station. The total capacity of these tanks should be at least 5 liters (quarts) per man, allowing for 20 per cent of wounded."

Drainage for action dressing stations is required.

Other fittings required are:

One action dressing locker, in two parts.

One double table for instruments and bandaging.

One folding table for refreshments.

Two small folding writing tables.

One washstand with two basins.

Electrical connections for sterilizing apparatus and for a number of electric fans.

One shelf for sterilizing apparatus.

Two hooks for a bottle stand.

Additionals are: Half tubs, water buckets, swabs, brooms, refreshments, etc. One Roth-Drager oxygen apparatus is necessary. For warming water, a Schaffstadt apparatus or electrical stove is used; for cooking instruments and for sterilizing material, a Lautenschlager sterilization apparatus with electrical connections is made use of.

The French Ministry of Marine (Reglement du Juin 2, 1902) issued a regulation which, however, gives only the most general principles of the French medical service on board ship during an action. Accord-

ing to this regulation, there is but one "Poste Principale" (dressing station; distributing station of the English; action dressing station of the Germans). This is located beneath the protective deck (as the distributing station of the English), in a place communicating directly and freely with the places whence the wounded must come to it. All that the regulations say with regard to this place is that it should be of convenient size, properly fitted out and well lighted and ventilated. The same regulation directs that all superimposed hatches, communicating with the decks below, must be provided with lowering apparatus and supplied with the various means for the transport of the injured. The dressings used are of three sizes, namely, small, medium, and large. A distinction is made, also, between mere temporary and protective and more permanent and antiseptic dressings.

In conclusion I would state that I have endeavored, in this report, to collate facts such as they are, without advancing any opinions of my own on the various subjects mentioned.

PROGRESS IN MEDICAL SCIENCES.

LABORATORY.

REPORT ON ORGANISMS, ISOLATED FROM THROAT CULTURES, SHOWING NEISSER GRANULE STAINING CHARACTERISTICS.

By Asst. Surg. D. G. ALLEN, U. S. Navy.

Cultures taken from throats with sterile swabs, and a Loeffler's blood-serum tube inoculated; a glycerin and plain agar plate were also streaked with the same swab.

The next day there was a moderately extensive growth on the blood serum tube; a smear was made from this and stained by Gram's method. It showed the presence of positive cocci of the morphology of staphylococci and streptococci, and a positive and negative bacillus. There was also found a small diplococcus occurring in pairs and fours.

Of the two streaked plates there was a more profuse growth on the glycerin agar plate than on the plain agar and there seemed to be three types of colonies: (1) A large, round, white colony with an even border—a staphylococcus colony; (2) a small transparent grayish-white colony—a streptococcus colony, and the third type was a colony about midway in size between the other two, white in color.

A smear was made from this colony and stained by Gram's stain. It showed a diplococco bacillus. From this same colony a transplant was made on a blood serum and plain agar tube. Twenty hours later the tubes were examined and a growth was present on both tubes, more profuse on the blood-serum tube.

Smears were made from this growth and stained by Gram's method and again showed the presence of the positive diplococco bacillus in pure culture. Other smears were made and stained by Loeffler's methylene blue and by Neisser's stain. By these methods the cocci were not stained evenly, but showed a dotted or beaded appearance.

The following media were inoculated from the growth on the blood-serum-tube: Bouillon, gelatin, litmus milk; and the sugar serum water media with litmus, composed of these sugars—maltose, mannit, dextrin, glucose, and saccharose. After twenty-four hours the bouillon was cloudy with a slight precipitate at the bottom of the tube; no pellicle. Its original acidity was changed from + 1.35 to + 1.8. The

gelatin was not liquefied. The litmus milk and the sugars were unchanged. After forty-eight hours the acidity of the bouillon was + 2. The gelatin still unliquefied. The litmus milk slightly acid, and of the sugars, the maltose, saccharose, glucose were fermented, the mannit and dextrin remaining unchanged. On the third day the bouillon was + 2.1. On the fourth day the bouillon was + 2.3. At the end of seven days the bouillon was still + 2.3, the other media remaining the same as on the third day.

A second series of tubes were run through with the same results.

From the above, especially from its staining characteristics with Loeffler's methylene blue and Neisser's stain, this organism would appear to be of considerable importance because of the possibility of mistaking it for the *bacillus diphtheriæ*, as it shows the blue granule staining very strikingly.

This organism has been noted during the past year on several occasions in smears made from throat cultures in suspected cases of diphtheria, and it has been found in cases where the diphtheria bacillus was present, and again in cases where it was absent. Again, in some respects, especially the morphology on fresh culture media, this organism resembles the diplococcus crassus, and at times in older cultures it took on the characteristics of a bacillus resembling the *bacillus coryzæ segmentosus*.

A RAPID METHOD FOR THE DETERMINATION OF AMMONIA IN URINE.

By Hospital Steward R. W. King, U. S. Navy.

This represents original work carried on in the laboratories of the United States Naval Medical School, Washington, D. C.

Chemical methods, to appeal to the clinical chemist, must not only be sufficiently accurate, but they must be capable of easy and, if possible, rapid application. Those methods which require expensive, seldom used, and complicated apparatus, as well as the expenditure of days or even hours for their completion, are not usually available to the average clinical worker. Then, too, the accuracy of such methods are only vouchsafed upon the supposition that they are carried out in the hands of a trained chemist, and in the hands of others they would, in the majority of cases, be much more inaccurate than the simpler and quicker processes. These remarks are peculiarly applicable to the methods which are so generally recommended for the determination of ammonia in urine.

The recent method proposed by Folin requires about two hours, whereas the older methods could not be completed within as many days. Believing that a method equally accurate and much more rapid than that of Folin was possible, and knowing that it was

desirable, a considerable amount of time has been devoted to the matter.

The difficulty to be met would appear simple enough. The thought occurred that in the distillation of alkaline solutions of urea, the degree of alkalinity and other things being constant, the amount of ammonia resulting from ureal decomposition would also be a constant; and that the determination of the value of these constants would eliminate the only real difficulty that has presented itself to the rapid determination of ammonia in urine. With this object in view aqueous solutions of urea ranging from ½ to 8 per cent were prepared. In carrying out the experiments 10 c. c. of the various solutions were diluted with distilled water to 50 c. c., and 0.5 gram of sodium carbonate added. These were then distilled until exactly 25 c. c. of distillate were collected. The anticipated results were confirmed. When the distillation was so conducted that the 25 c. c. of distillate were collected in equal periods of time, it was found that the amount of ammonia produced was directly proportional to the percentage of the urea present.

The influence of the time required for the collection of the distillate is well shown by the following results obtained with a 2 per cent solution of urea:

Time required, 6½ minutes, gave 1.2 c. c. decinormal ammonia.

Time required, 3½ minutes, gave .9 c. c. decinormal ammonia.[a]

Now, if the determination of the ammonia is carried out, as recommended below, the time for the collection of the 25 c. c. of the distillate will always lay between three and six minutes, and usually between four and five minutes. The time being estimated from the time when well-marked boiling begins, as was done in all the experiments. It is true that the accuracy of this method is based upon the constancy of these conditions, but they would appear to be conditions which even the grossest carelessness could hardly avoid.

The results of all experiments along this line may be briefly stated as follows: When 50 c. c. of a 1 per cent aqueous solution of sodium carbonate containing less than 8 per cent of urea is distilled so that 25 c. c. will pass over within six minutes from the time boiling begins, the amount of ammonia produced from ureal decomposition will be $\% \frac{\text{urea}}{2} - .0017$. Or there will be just one-half as many c. c. of decinormal ammonia as the percentage of urea contained in the solution. An easy calculation shows that this gives a factor which may, for all clinical purposes, be used with safety. The error could hardly be greater than 2 per cent, even in normal urine, while this would be

[a] For a 4 per cent solution the amount of ammonia was just doubled, while for a 1 per cent solution it was halved.

reduced in all cases where an increase of ammonia was present. The method has been rigidly tested by the addition of known amounts of decinormal ammonium sulphate solution to solutions of urea, urine, etc., and the results would indicate that it is not only the simplest and most rapid, but is probably the most accurate method available for the clinical laboratory.

In order to facilitate as much as possible the determination of ammonia in urine, the writer has designed a special form of jar for the collection of the distillate. The arrangement is such as to avoid the loss of any ammonia that might otherwise occur as a result of imperfect condensation. The accompanying illustration will convey an idea of the convenience and advantage to be gained by their use. They are of heavy glass and are very substantial. A 25 c. c. and a 50 c. c. mark extend entirely around the circumference of the cylinders. The jars were furnished by Eimer and Amend, of New York City.

In carrying out the determination of ammonia in urine, pour 25 c. c. (from pipette) of decinormal sulphuric acid into the jar. The side funnel is then loosely packed with plain absorbent cotton. This is moistened with the acid solution by gently tilting the jar, being careful not to get the cotton "soaking wet"—it is only necessary that it be moistened. This is now covered with a layer of dry cotton. If the cotton plug in the side funnel has been packed too tightly, or too much of the acid solution has been allowed to flow into it, the cotton will be pushed upward by the escaping air when distillation begins. Should this occur the cotton should be loosened with a pair of forceps, so as to allow the excess of fluid to return to the cylinder. The end of the condenser, carrying a rubber stopper, is now fitted into the cylinder, as shown in the diagram. Ten c. c. of fresh albumin free urine (if the urine can not be obtained perfectly fresh it should be preserved by the addition of a few drops of formaldehyde. Slight traces of albumin need not be removed) are diluted with distilled water to make 50 c. c., and poured into a distilling flask containing 0.5 gram of sodium carbonate. The flask is then quickly heated and well-marked boiling continued until exactly 25 c. c. of distillate are collected; this should not require longer than six minutes after the boiling begins. When the fluid in the cylinder reaches the 50 c. c. mark the jar is immediately removed. The cotton is removed from the side funnel by means of a small pair of forceps and placed in a beaker. Over this is then poured the contents of the jar. A few c. c. of distilled water is then poured through the side funnel and added to the contents of the beaker. The cotton does not interfere with the subsequent titration. The excess of acid is now determined by means of decinormal solution of sodium hydroxide, using cochineal or rosalic acid as indicator. If the number of c. c. of the alkaline solution

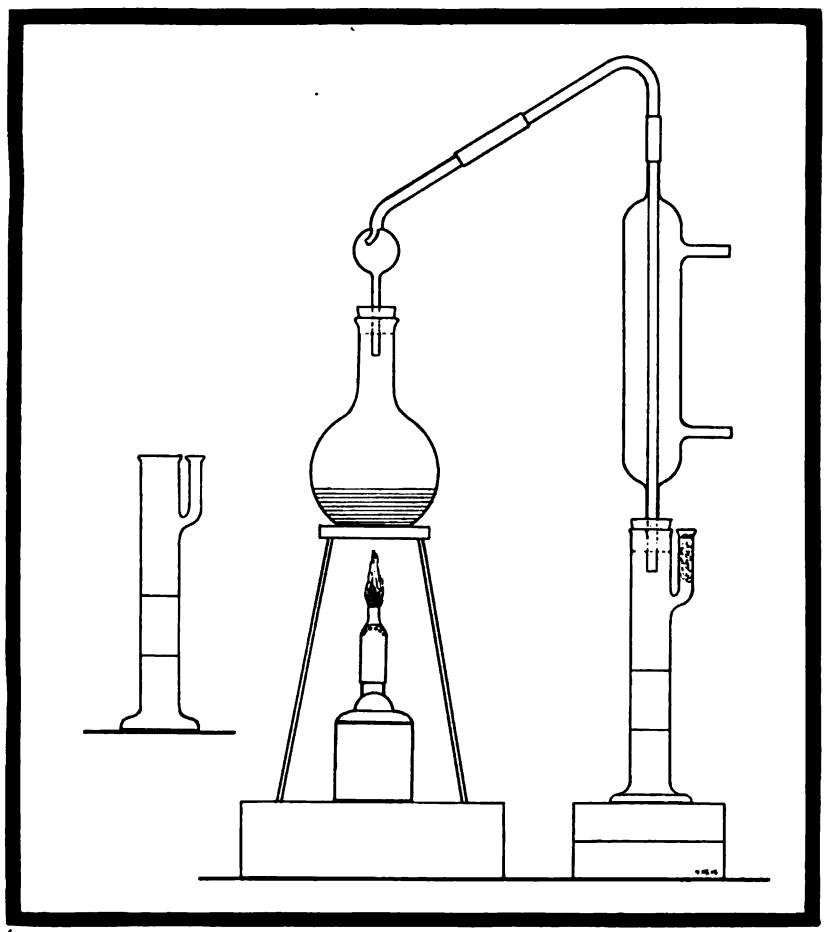


FIG. 1.—APPARATUS FOR DETERMINING AMMONIA IN URINE BY RAPID METHOD.

required are substituted for Y in the following equation, in which U is the percentage of urea present, X will represent the number of milligrams of ammonia contained in 100 c. c. of the urine:

$$x = 17\left[25 - \left(y + \frac{u}{2}\right)\right].$$

Thus, suppose the urine contained 3 per cent of urea, and 15 c. c. of the sodium hydroxide solution were required, we have:

$$x = 17\left[25 - \left(15 + \frac{3}{2}\right)\right]$$

$$x = 17\left[25 - 16\frac{1}{2}\right]$$

$$x = 17 \times 8\frac{1}{2}.$$

Whence x equals 144.5, the number of milligrams of ammonia contained in 100 c. c. of the urine.

Normal urine will usually give from 50 to 100 mgs, the average probably being about 70 mgs. The character of the diet will, of course influence the normal.

THE DETECTION OF OCCULT BLOOD IN FECES, URINE, AND STOMACH CONTENTS.

By Hospital Steward R. W. King, U. S. Navy.

This represents original work carried on in the laboratories of the United States Naval Medical School, Washington, D. C.

The expression "occult blood" is perhaps generally understood as applying to blood minus the red cells; and "occult hemorrhages" are commonly considered as being those not manifest either macroscopically or microscopically. All slight hemorrhages into the gastro-intestinal tract are, of course, apt to be occult, owing to the rapidity with which the red cells are destroyed in the stomach and intestines

All the tests for the detection of occult blood are based upon the reactions which are given by hemoglobin or its derivatives.

Those available are:

(1) Heller's test.
(2) Teichman's hæmin test.
(3) The spectroscope.
(4) Benzidin.
(5) Guaiacum.

Briefly reviewed these are:

Heller's test.—This test is only applicable to urine. It is based on the red color which is imparted to the precipitated phosphates, by

blood pigment, on boiling the urine in the presence of sodium or potassium hydroxide. Exaggerated claims have been made for the delicacy of the test. In reality its application to urine is attended by a large element of uncertainty, while for feces it is entirely worthless.

Teichman's hæmin test.—This is a very reliable test for blood pigment, but it is not sufficiently delicate to be of any value for the detection of minute traces of blood. Vierort's recommendation that the test be applied to feces by washing out the blood, evaporating the water and applying the test to the residue would, for clinical purposes, be very impracticable. Stuve's method was an attempt to apply the test to urine by precipitating the blood pigment with tannic acid and using the precipitate. It is generally admitted that this method is uncertain.

The spectroscopic test.—Given a good spectroscope—they are very expensive—in the hands of an experienced person and it will be generally conceded that the spectra of the various forms of hemoglobin afford one of the most accurate means for the detection of blood. The spectroscope is not, however, very well adapted for the clinical detection of blood in urine, feces, etc., since it is necessary to have a liquid nearly free from color. The blood must be in a comparatively concentrated solution in order to respond to the spectroscopic test. The presence of other coloring matter renders the recognition of blood pigment less certain by giving spectra similar to that of hemoglobin.

The benzidin test.—This test was introduced by O. and R. Adler (1904). They found it sensitive to a 1:100,000 watery dilution of blood. This extreme delicacy, if real, would appear rather as an objection to, than a recommendation for, the use of the test. Clinically speaking, there is no occasion for the detection of such minute traces of blood. Other substances than blood pigment produce the reaction with benzidin, and in this respect it apparently offers no advantages over the better known guaiacum test.

The method as originally employed by O. and R. Adler is now generally admitted to be unreliable. They took a mixture of 3 c. c. of a sat. alc. sol. of benzidin and 2 c. c. of 3 per cent hydrogen peroxide to which was added a few drops of acetic acid, and a small amount of feces. In the presence of blood a blue or green color results.

The present method of applying the test is as follows: A small amount—2 or 3 grains—of benzidin is placed in 2 c. c. of acetic acid, and 2 or 3 c. c. of a 3 per cent solution of hydrogen peroxide added. A small piece of feces—the size of a pea—is boiled in a test tube one-fifth filled with water. Of this a few drops are added to the acetic acid mixture. It is claimed that this method of applying the test is

reliable—it certainly can not be very delicate. A very small amount of fecal matter is taken to begin with, and any blood it may contain is diluted about twenty-five times with water. This excessive dilution certainly militates against delicacy to a dangerous extent. It is probable that a blue color resulting on the addition of a few drops of this homeopathic solution would be a pretty reliable indication of the presence of blood, but unfortunately the absence of the reaction would have but little significance where traces of blood were involved.

Our experience with benzidin has not been sufficiently ample to justify an opinion of its real value; but so far as it goes we have seen no reason to accord it any advantages over the guaiacum test.

The guaiacum test.—This is van Deen's old test. And after all the adverse criticism that has been leveled at it it still remains, in the author's opinion, the best, most delicate, as well as the most reliable, means for detecting traces of blood pigment.

It has been objected to on the ground that many other substances than blood will respond to it. But the same objection may, with equal propriety, be applied to perhaps all the tests of analytical chemistry. Sulphuric acid is a splendid reagent for the detection of barium, with which it gives a heavy white precipitate. A precipitate having a similar color characteristic is also produced with many other metals, as calcium, strontium, lead, etc. But this is no valid objection to the use of sulphuric acid as a reagent for barium. Nor does the fact that subacetate of lead will produce a bluish green coloration with guaiacum constitute an objection to the use of guaiacum as a test for blood pigment. All the tests of analytical chemistry presuppose that they are to be applied under proper conditions. Thus in hydrochloric acid we have a delicate and reliable means of detecting silver, but the reaction is totally unreliable in the presence of salts of lead and mercury (ous) unless special precautions are taken. Likewise, guaiac is a delicate and reliable test for hemoglobin (hæmatin) in the absence of interfering substances. The laws of chemistry are inflexibly exact, but it matters not what reagents we use, unless other conditions are properly guarded no one can predict or decipher the results.

Chlorophyll gives a spectrum that might easily be confounded—by the inexperienced—with that of blood, and the finest spectroscope is worthless for the detection of hemoglobin unless the proper conditions are present. Teichman's reaction has failed even when pure blood was used.

It is the writer's opinion that what we need is not a new test for blood, but a better and more reliable way of applying the old one—a method that will enable us to obtain, if possible, the hemoglobin derivatives in a solution which is free from all other substances that may prevent, duplicate, or confuse the reaction.

Seiffert and Mueller recommended that the hemoglobin be extracted from the feces by means of acetic-acid ether. The feces being digested with the acid and the resulting hæmatin extracted with ether. This was a step in the right direction, but apparently it was taken in the dark, for they were led to rely on the color of the ether as affording evidence of the presence or absence of blood pigment. Weber wisely suggested that the guaiac test be applied to the ether. Weber's method, as it is called, of extracting the feces with acetic acid and ether is a rather disagreeable proceeding, and perhaps as much on this account as any other it has never become very popular.

Although the matter has received only preliminary and somewhat divided attention, the results would seem to be rather encouraging. While by no means willing to rest satisfied with the degree of success attained, yet it is thought that the method at present employed in this laboratory is the simplest and most reliable means for the detection of traces of blood in urine, feces, and stomach contents. For this reason it is submitted to those who may have occasion to use it.

Two solutions are required: (1) Alkaline alcohol, prepared by adding 10 c. c. of a 10 per cent aq. sol. sodium hydroxide to 90 c. c. of 95 per cent ethyl alcohol. (2) Acid alcohol, prepared by adding 40 c. c. of glacial acetic acid to 60 c. c. of 95 per cent ethyl alcohol.

The detection of blood in urine.—Into a centrifuge tube containing 2 grams of dried calcium phosphate pour 5 c. c. of the suspected urine. Mix well by stirring with a glass rod. (A pipette, the pointed end of which has been sealed off in the flame, makes a convenient stirring rod.) The tube is then filled with the alkaline alcohol which, after thorough mixing, is centrifuged for a minute or so. The supernatant fluid is then poured off and the tube again filled with the alkaline alcohol and treated as before. The supernatant liquid is again poured off and 5 c. c. of the acid alcohol is added. This is thoroughly mixed by means of a glass rod, and again centrifuged for a moment or so. The supernatant acid alcohol contains all the hemoglobin—as hæmatin—that was present in the 5 c. c. of urine. It is poured into a clean test tube and about 10 drops of a freshly prepared tincture of guaiac added. (Instead of the tincture of guaiac, which does not keep well, a small amount of freshly powdered guaiac may be used—an equal amount of benzidin would probably answer as well.) Hydrogen peroxide is now added drop by drop until about 15 drops are used, unless a blue or green color should appear sooner. In the presence of blood a blue or greenish blue color will develop, the latter indicating smaller quantities than the former.

Minute traces of blood were added to a specimen of urine which had failed to give the reaction. The guaiac and benzidin tests applied directly to this urine containing blood gave no reaction. The spec-

troscopic analysis was also negative. When treated by the method given above an intense blue color developed immediately on the addition of the peroxide.

The detection of blood in gastric contents.—The gastric contents should, if necessary, be strained to remove large pieces of food, etc. Five c. c. are then treated exactly as directed for urine.

The following experiment was carried out: Artificial gastric contents were prepared containing acid albumin, albumin, gluten bread, wheat bread, cornstarch, rice flour, and beans, the latter being dried and powdered. Five c. c. of this was treated as directed and the results negative. A trace of blood was now added. The guaiac and the benzidin tests were both negative when applied directly. After treating as for urine containing blood a rich blue color gave evidence of the presence of the pigment, the color developing immediately.

The detection of blood in feces.—If the feces are not already liquid, they should be rubbed up with sufficient water to make them so. Five c. c. are then treated as directed for urine. (It will rarely happen that a stool contains a large amount of carbonates, when on addition of the acid alcohol marked effervescence will occur. In these cases the stool is treated as follows: Ten c. c. are made faintly acid (litmus) by adding a few drops of the acid alcohol. After effervescence ceases it is made slightly alkaline with the alkaline alcohol. Five c. c. of this is used for the test.) In centrifuging the feces mixture with the alkaline alcohol, it sometimes happens that a portion of the organic material remains in suspension. This should be poured off along with the alkaline alcohol.

For lack of time it has so far been impracticable to determine the delicacy of this method for blood in feces; but there is no question but that it is far more delicate and reliable than the test as applied to watery suspensions of fecal matter. Time and again this has been confirmed by adding traces of blood to feces which had been found negative. The addition of the blood failed to give a response with the tests as applied directly to the stool. Such failure has not occurred when the method here recommended was employed.

The acid alcohol will always have a more or less yellow color, and for this reason the clear blue reaction was not obtained with feces as with urine or stomach contents; it is apt to be more of a bluish-green. It should be remembered that the color produced in these reactions is not permanent. It will usually fade out after the lapse of a few minutes, but while present it is perfectly distinct.

Since writing the above there has been opportunity to do a little additional work, and the results have been all that has been claimed. While it is believed that the simple processes as given above are sufficiently delicate for most, if not all, clinical work, yet we have been able to so modify them as to reach the greatest degree of delicacy

that has, so far as we are informed, been recorded for the detection of blood in urine, feces, and stomach contents. The modified methods are as follows:

For urine: Pour 100 c. c. of the urine into a flask containing 2.5 drams of dried calcium phosphate, and add 5 c. c. of a 10 per cent aq. sol. sodium hydroxide; bring to the boiling point; cool in running water and filter. The residue on the filter contains all the hemoglobin present in the 100 c. c. of urine. The filter paper containing the residue is transferred to a small beaker and 10 c. c. of the acid alcohol added. This is allowed to macerate for two or three minutes, stirring well with a glass rod. The fluid is now poured into a centrifuge tube. Be sure to express as much of the fluid from the paper as possible; but do not put the paper in the tube. This is now centrifuged, and the clear acid alcohol tested as directed above, using either a freshly prepared tincture of guaiac or the freshly powdered gum. Do not use benzidin.

This test gives a distinct blue reaction in the presence of one part of blood in five thousand of urine. The limit is about one part in ten thousand. By using 200 c. c. of the urine even this great delicacy could be exceeded.

For feces: Twenty-five c. c. of the liquid—made so if necessary by adding water—are diluted with water to 100 c. c. A few drops of acetic acid are added to give a faint but distinct acid reaction (litmus); and the mixture filtered, preferably, or strained through a layer of gauze. One hundred c. c. of the resulting fluid are treated as though it were 100 c. c. of urine.

For stomach contents: Take 100 c. c. or less according to character and the degree of delicacy desired. If less than 100 c. c. are used, make up to that amount with water. Filter or strain, and treat the filtrate as 100 c. c. of urine.

PRACTICAL APPLICATION OF KING'S METHOD FOR OCCULT BLOOD IN THE DIAGNOSIS OF BLACKWATER FEVER.

By Surg. E. R. Stitt, U. S. Navy.

In connection with the method proposed by Hospital Steward King, of this laboratory, for the detection of occult blood, certain experiments have indicated its possible great value in the early diagnosis of hæmoglobinuric fever.

Using an Abbe microspectroscope (Zeiss) I made a dilution of blood in urine. With a dilution of 1 to 200 the absorption bands of oxyhæmoglobin were very distinct. In the 1 to 300 they could still be observed. Carrying on the dilution to 1 to 500 it was impossible to observe any indication of such lines.

This same specimen when tested by King's method almost instantly gave a striking positive reaction. The test can be obtained when the dilution approximates 1 to 5,000, about—1 drop of blood in a pint of urine.

Instead of using the comparison prism, I have found that I could get more satisfactory outlining of the absorption bands by quickly raising and lowering the tube containing the blood by a piston-like movement. When down, the light entering the prism passes through the column of diluted blood; when raised, there is no such intermediary.

CHEMISTRY AND PHARMACY.

By Asst. Surg. E. W. BROWN and Pharmacist P. J. WALDNER, U. S. Navy.

PANCOAST, Dr. GEORGE R., and PEARSON, W. A. **Natural salicylates.** (American Journal of Pharmacy, September 1, 1908.)

This article deals with the problem of detecting either the substitution of the synthetic salicylates for the natural products, or the more or less adulteration of the oils of gaultheria and birch with synthetic methyl salicylate. The authors point out that while the oil of gaultheria seems to differ from the synthetic product only in that it contains very small quantities of a paraffin (triacontane), a secondary alcohol ($C_{30}H_{16}O$), and an ester ($C_{14}H_{24}O_2$), whereas synthetic methyl salicylate contains probably ortho and meta creosotic acids, to which its ill effects are ascribed; the considerable difference in therapeutic effect leads to the assumption that there exists a more important factor, and gives rise to the question as to whether there may not be a difference in structural formula. The following tests, given by the authors, are easily applicable with the facilities usually at hand, even on board ship:

Color reaction.—Treat 1 drop of oil with 2 drops of hydrochloric acid and rotate rapidly in small evaporating dish; add 1 drop of nitric acid and rotate again; then 2 drops of sulphuric acid with further rotation. Pure oils give a yellow final color; synthetic methyl salicylate, pink.

Odor tests.—Oil of gaultheria, oil of birch, and methyl salicylate have each a characteristic odor. Pure oil of gaultheria has a very heavy, not particularly strong, but quite persistent odor; oil of birch has a sort of peppery, woody odor, yet not so sharp as the synthetic product. Methyl salicylate has a sharp, more agreeable odor than the others. The difference in their odors can be more readily recognized by taking accurately 1 c. c. of each, and mixing with separate portions of 100 gr. of powdered sugar, or by dissolving 1 c. c. in 50 c. c. of alcohol, and pouring into 1 liter of water. The relative turbidity of these mixtures is to be noted. The synthetic methyl salicylate will become clear before either oil of birch or gaultheria. The

solutions may be diluted with a larger amount of water and the relative odor intensity of the very dilute solutions noted.

Cone's test.—This test is of much value in passing on the quality of an oil. It is reliable within certain limits if certain details are very carefully complied with. Two stock solutions are required:

		Cubic centimeters.
No. 1.	Caustic soda	320
	Water q. s.	4,000
No. 2.	Hydrochloric acid	1,280
	Water	4,000

Place 6 c. c. of the oil in a 500 c. c. round-bottomed flask and add 25 c. c. of solution No. 1 and 25 c. c. of water. Boil till clear. Pour in 350 c. c. of hot water and bring to a boil. Now add 25 c. c. of solution No. 2 and boil for a few moments, then set aside in a moderately warm place, so that crystallization will be slow.

A pure oil will give the characteristic large, square-ended, laminar, opaque crystals, which occupy comparatively little space. Methyl salicylate under same conditions will give fine, needle-shaped, voluminous, opaque, fluffy crystals, which occupy nearly all of the flask.

Mixtures of the pure oil with synthetic methyl salicylate give gradations between these extremes, and by making tests on admixtures of known strength, crystals from a given sample may be compared and an intelligent idea obtained of the proportion of adulteration.

Several trials should be made with each sample. It was found that certain details must be carefully watched, namely, having a slight excess of oil after saponification is complete, also in not losing any hydrochloric acid by excessive ebullition while it is being added. All measurements must be made accurately. One indication of a genuine oil of birch is the formation of a transient pink color when about half the hydrochloric acid has been added, also the characteristic woody odor at the same time. It is true that irregular results are sometimes met with, but no doubt they are often due to some little fault in manipulation.—(P. J. W.)

CATHCART, E. P.; KENNAWAY, E. L.; LEATHES, J. B. **The origin of endogenous uric acid.** (Quarterly Journal of Medicine, July, 1908.)

This article gives the result of a number of carefully conducted experiments made with a view to testing the validity of Hirschstein's recent explanation of the fact that the rate at which uric acid is discharged from the body is greater during the day than it is at night, namely, that it is due to the retention of uric acid during the inactive hours of sleep; and the fact that it is during the first waking hours that the rate of excretion is greater than at any other time in the day may be ascribed to the rapid discharge of the uric acid that has accu-

mulated during the night. This theory, which would imply that the rate at which uric acid is produced in the body is fairly constant at all times, Hirschstein supported by evidence based on results which he obtained by the administration of thymus at varying hours of the day with a selected diet.

The authors of this article conducted experiments on similar lines, but arrived at the conclusion that—

The output of uric acid is normally low at night and high in the morning, not because as much uric acid is formed during the night as during the day and some of it retained until morning, but because the rate of production is lower during the night than the day and higher in the first hours of the day than during the later hours. * * *

That the diurnal fluctuations in the rate of uric acid excretion correspond to fluctuations in the activity of some function or functions of which the endogenous uric acid is the chemical expression.

To further substantiate this belief numerous experiments are cited in which the effect of muscular exertion under varying conditions of temperature and bodily exposure were carefully noted and results determined by an accurate analysis of the urine. Briefly stated, the experiments included light dumb-bell exercises, gradually increasing the weights; heavy bicycle riding after placing the subject on diet of bread, butter, and milk; sawing and chopping wood; bicycling followed by skating, etc.

From these experiments the authors made the following deductions:

(1) That during severe muscular exertions the output of uric acid is lowered.

(2) Muscular activity is followed by the excretion of uric acid in greater amounts than are normal, and this increased excretion may last for forty-eight or seventy-two hours.

Still more elaborate experiments followed, such as sponging a subject, sitting in a cold bath continuously with cold water for seventy minutes; rectal temperature at the beginning 100.3, at the end 96.3. All these experiments taken together led to the following general conclusions:

1. A marked increase in the output of endogenous uric acid has been found to occur in three conditions: (a) Fever; (b) exposure to cold; (c) after severe exertions. The increased output coincides and terminates with the febrile rise of temperature, coincides with and outlasts by many hours the exposure to cold, follows the exertions and lasts for many hours after them. It is suggested that in all these three conditions the uric acid has its origin in metabolic processes occurring principally in the voluntary muscles, and not immediately related to voluntary contractions and work.

2. The daily tide in uric acid excretion—high output in the morning, low output at night—is not due to retention of uric acid formed during the night; nor is it due to the fact that the digestive organs are inactive during the night, if that is a fact, with the last meal taken at 9 or 10 p. m., as in most of our experiments. It is rather due to the quickened activity of all functions, especially those of the voluntary muscles, which results from the rest of sleep.

3. Generally speaking, the more lively the performance of the functions of the body as a whole the greater the amount of uric acid produced will tend to be.—(P. J. W.)

SCHREIBER, Prof. KARL. **Die Chemische untersuchung von Trinkwasser an der entnahmestelle—The chemical examination of drinking water at the source of supply.** (Zeitschrift für Medizinalbeamte, January, 1908.)

In this paper Professor Schreiber describes some ready methods for the chemical analysis of water by means of apparatus and reagents which he has devised in a convenient portable form. He gives some ingenious methods for several tests, which while not entirely accurate are convenient, and their indications valuable; particularly his method for the detection of iron, which consists in simply shaking water with free access of air and allowing to stand—cloudiness and later a precipitation of ferric hydroxide indicating iron when present in quantity over 1 part in 100,000. When water is to be conducted through leaden pipes it is essential that its power of dissolving lead should be determined. This may be done by immersing in the water, contained in an absolutely air-tight jar, a section of lead pipe previously cleaned with nitric acid and distilled water; removing after twenty-four hours, and then testing the water for lead content. Professor Schreiber does not wish to be understood as discounting in the least the greater value and importance of a thorough analysis in the laboratory, but insists that a partial examination is better than none, particularly when a bacteriological and microscopic examination is out of the question, and that the person on whom the responsibility for a decision as to the potability of any water rests is morally bound to do the best in his power with the facilities available. The first essential for a proper estimate of the fitness of a water must always be a study of the geological and hydrological nature of the locality of the source as well as the condition and construction, either natural or artificial, of the collecting reservoir. These being favorable and the water in its physical aspect good, as determined by its color, odor, and taste, a chemical examination done on the spot will give the inspecting authority reasonable moral assurance that the water is potable. Moreover, in the absence of other disqualifying factors, the detection of a simple chemical impurity may point the way to a practical remedy which may conserve to usefulness an otherwise useless water supply. In the outfit which Schreiber has devised the volumetric solutions required for the usual tests are prepared by dissolving accurately made tablets in distilled water, and Nessler's reagent is carried in a hermetically sealed tube to be broken when required.—(P. J. W.)

ROBSON AND CAMMIDGE. **The pancreatic reaction of Cammidge in the urine.** (The Pancreas: Its Surgery and Pathology, 1907.)

Cammidge claims that there is a definite and important relationship between his pancreatic reaction in the urine and disease of the pancreas. The results of other workers go to support this view.

particularly when considered in connection with the examination of the feces for neutral fat.

The principle of the reaction depends upon the formation in the urine of a substance having the characters of an unfermentable pentose sugar after boiling with hydrochloric acid. It is not present in the original urine as such, and forms an osazone on treatment with phenylhydrazine, easily distinguished from the corresponding compound of glucose. As the presence of glucose would seriously interfere with the success of the reaction, all specimens of urine examined must be carefully tested for glucose, and, if present, must be removed by fermentation with yeast cake. Glucose is rarely present.

The technique of the reaction requires considerable time, but is easy of manipulation, and should be readily carried out in any service hospital. The urine, if alkaline, must be made acid in reaction, and any albumin or sugar present must be removed and the urine made up to its original bulk with distilled water. To 40 c. c. of the clear filtered urine are added 2 c. c. of concentrated hydrochloric acid, and the mixture gently boiled for ten minutes in a small flask, using a funnel in the neck as a condenser. It is now cooled, and distilled water added to again make the contents up to 40 c. c., owing to the loss by evaporation.. Eight grams of lead carbonate are now slowly added to neutralize the excess of acid. After standing for a few minutes, the flask is again thoroughly cooled, and the contents filtered until perfectly clear. The filtrate is then well shaken with 8 grams of powdered tribasic lead acetate, and the resulting precipitate removed by filtration, which is repeated until perfectly clear.

The excess of lead in solution must now be removed by treating with 4 grams of powdered sodium sulphate; the mixture is heated to boiling, then thoroughly cooled and filtered. From the filtrate are measured 17 c. c.; this is transferred to a small flask with a funnel condenser, and there are added 2 grams of sodium acetate, 8 grams of phenylhydrazine hydrochloride, and 1 c. c. of 50 per cent acetic acid. The mixture is then boiled gently for ten minutes, filtered into a test tube provided with a mark showing 15 c. c. and made up, if necessary, to that point with hot distilled water. The filtrate is carefully stirred and left to stand overnight.

The quantity and time of deposit of the crystals will depend upon the degree of extension of the inflammatory process in the pancreas. Thus, in well-marked cases, a light-yellow flocculent precipitate should appear in a few hours, but in less characteristic cases it may be necessary to leave the preparation overnight before a deposit occurs. Under the microscope the precipitate is seen to consist of long, light-yellow, flexible, hairlike crystals of pentosazone, arranged in delicate sheaves.

It is claimed that in perfectly normal urines these crystals are never seen, even in traces. It is therefore always necessary to examine the urine carefully by a control test for glucose, carrying out the same procedure as above, except that the 40 c. c. of filtered urine is not boiled with hydrochloric acid.—(E. W. B.)

SURGERY.

By Surg. H. C. Curl and P. A. Surg. H. W. Smith, U. S. Navy.

SURGICAL PROGRESS.

Aneurysms.—If we can judge by the frequency with which surgeons are reporting work upon blood vessels, it would seem that this interesting, and hitherto discouraging, field of work would become of considerable practicable importance.

Several writers of prominence, in giving their impressions and experiences, mention the great similarity between the peritoneum and the lining of the arteries.

Union results from the apposition of the endothelium, the outpouring of lymph and its later organization. Warning is given that, like the peritoneum, if too great strain is put on this union, it will stretch and cause renewed aneurysmal bulging. Doctor Morris urges that a considerable danger of recurrence comes from the leaving of even a small pit or depression in the vessel wall, from which, as in hernia, pressure from within wedges out a greater opening.

Doctor Blake, of New York, emphasizes that the retaining, permanently, of a patent vessel is not the principal aim of the Matas operation, and that any other understanding of it is a misconception of the originator's idea.

Doctor Binnie sums up the different theories regarding etiology: While he considers Councilman's theory important, he gives prominence to the opinions of those who argue against arteriosclerosis as a cause of aneurysm.

Doctor Binnie's figures as to the relation of syphilis to aneurysm are 80 per cent, while special attention is called to the fact that atheroma is a disease of old age, while aneurysm is a disease occurring most often between the ages of 30 and 50.

The reports of cases indicate that where the vessel walls are in good or fairly good condition, the Matas technique is usually successful, but where the walls of the aneurysm are degenerated and friable, and where there has been a rupture of the sac, no satisfactory support can be given the immediate sutures and secondary hemorrhage is common.

Several prominent operators say they will try the new methods on the first suitable case of abdominal aortic aneurysm.

Doctor Blake does not favor the typical Matas with attempt to preserve the vessel in popliteal aneurysm, but advocates the "obliterative" operation by the Matas method. He considers this as best because constant motion from walking subjects the popliteal space to too much traumatism.

LEXER, ERICH. **Substitution of whole or half joints from freshly amputated extremities by free plastic operation.** (Surgery, gynecology, and obstetrics, June, 1908, p. 601.)

A distinct advance in the treatment of anchylosis is made by Lexer's procedure of removing the articular surfaces from material obtained by amputation and substituting them for the surfaces of an anchylosed joint resected by operation. The material may be obtained also from cases recently dead of trauma or other non-infectious cause. Both the anatomical and functional results were excellent.

A single articular cartilage may be interposed, or, in the case of the knee, disks from both fémur and tibia together with the undisturbed crucial ligaments and semilunar cartilages. The disks become united to the freshened stumps on which they are pegged or wired and become a functioning part of their new host without trophic injury. Defects in the continuity of long bones brought about by operations for tumor or for osteomyelitis may be repaired likewise by material from amputations, the medulla of the graft being filled with bone wax. Mobility may be restored to stiff fingers with the aid of material from the patient obtained by the sacrifice of a toe.

CROSSEN, H. S., M. D. **Foreign bodies in the abdominal cavity.** (Interstate Medical Journal, August, 1908.)

The article discusses foreign bodies left in the abdominal cavity at operation and notes, of course, that sponges are most frequently left, and are far more dangerous than instruments.

He discusses the question under the heading: (1) How does the accident occur? (2) What are its consequences? (3) How may the accident be avoided?

Under No. 1 the author considers various ways of keeping account of all the sponges and considers each method heretofore in use as liable to be a failure. The commonest occasion for leaving a sponge is when the abdomen must be closed as hastily as possible, as the patient is weak and failing, and rapid closure is imperative. Failure to make accurate count, the addition or the loss of one in the articles about the table render these methods uncertain.

He then proposes a system for sponging and walling off which at first thought would seem decidedly cumbersome, but which, we are

assured, combines absolute safety as far as leaving gauze in the abdomen is concerned, with quite a degree of convenience in handling.

He has long strips of gauze folded in cloth bags; these strips are drawn as needed from the bags which are pinned securely on either side of the operative field; as a portion is soiled it is drawn along and allowed to drop on the floor, thus one long strip on each side of the field will supply all the sponges needed, can be used to wall off or pack for hemorrhage, and because there are no loose pieces to be forgotten, there is no danger of leaving a piece in the abdomen to cause serious trouble later.

This method would seem to sacrifice much to prevent an uncommon danger.

MURPHY, JOHN B. **Perforative peritonitis.** (Surgery, gynecology, and obstetrics, June, 1908, p. 565.)

In this very exhaustive article Doctor Murphy has discussed at length all phases of the subject. He has described the latest work on the anatomy and physiology of the peritoneum with particular attention to its absorptive powers.

Under "pathogenesis," "etiology," and "bacteriology" the bacterial invasions are discussed and classified, and under "symptoms" a complete and particularly good description of what to expect in these cases is given.

The details of treatment are considered in the order in which the pathological processes appear that cause the mortality.

First. The prevention of absorption is of the greatest importance, and much is to be done before the operation. The Fowler position, both before and after the operation, is advised, and it is considered best to place the patient in this position immediately upon making the diagnosis and keep him there until convalescence is well established.

Second. Withhold all food, place ice to abdomen, and (if necessary) practice gastric lavage, to prevent peristalsis. The use of opiates give a false sense of security, leading to dangerous delays.

Third. Anesthetic (ether by drop method is best): Start anesthetic after cleaning up is finished and when all is ready. Spinal or local anesthesia may be used, but it is not as good.

Fourth. Make an ample incision, so that you can do needed work and get out quickly.

Fifth. Always close perforations. Do not, however, take time to invert the stump of an appendix.

Sixth. Do not irrigate, but clean out pus by sponging.

Seventh. Fenestrated or split rubber tubes inserted to the stump of an appendix, or the site of an ulcer, and into the vesico-rectal pouch or other pus pocket is the only form of drainage permissible.

Eighth. Proctoclysis is instituted as soon as the patient is returned to bed. The fluid (about 1½ pints in two hours) is administered through an L tube from an irrigator suspended 6 to 14 inches above the level of the buttocks. The flow should be so controlled by its elevation so that if the patient endeavors to void flatus or strain the fluid can rapidly flow back into the irrigator; otherwise it will be discharged into the bed. The temperature of the water should be 100° and so maintained. If the solution is not being retained, it is not being given properly.

Ninth. Dressings should be changed as often as necessary for the comfort of the patient. The tube should be rotated a little every twenty-four hours to prevent its adhesion.

Tenth. For the post-operative ileus the usual treatments are used, especially hypodermics of eserine salicylate gr. $\frac{1}{40}$ every two hours as needed.

In summary Doctor Murphy says to operate early and rapidly, close perforation, drain and use the Fowler position and rectal irrigation, drain and watch for post-operative ileus.

ROYSTER, HUBERT ASHLEY. **The inconsistencies of the gauze pack.** (Annals of Surgery, August, 1908.)

The author in no unmeasured terms condemns the gauze pack for drainage. He considers it a plug and not a drain and that it should not be used. Rubber as tube, dressed tube or strips are to be preferred, but much unnecessary packing is done. Another thing condemned is the use of gauze to wall off before soiling a peritoneum locally.

The claim that the pack acts as a wick and carries more often than prevents infection is upheld, and attention is also called to the irritation of the peritoneum incident to the use of pads. His advice is to mop all free pus away and depend upon the peritoneum to handle residual infection.

As he says, in concluding, much of the advice given is unnecessary, but surgeons still cling to the use of gauze packing, and most to the pack for "walling off."

The above criticisms, it would seem, could hardly apply to brief temporary walling off to prevent soiling while an appendix is being cut or while an anastomosis is being done.

BATTLE, W. H., F. R. C. S. **The necessity for the removal of the appendix after perityphlitic abscess.** (The Lancet, London, July 11, 1908.)

The very fact of the appearance of this article by such a well-known surgeon, and in the Lancet, would indicate that the British

surgeons were not as united as American ones on the desirability of removing the appendix either at operation or, if not deemed advisable then, soon after.

Mr. Battle is himself in accord with this principle, and says that Sir F. Treves has also changed his ideas on the subject.

He emphasizes that merely draining a pocket of pus caused by a perforative appendicitis will not necessarily cause it to close, nor, if it does, prevent second attacks, which often do occur.

He urges early secondary operations where the organ has not been removed at the original operation, before firm adhesions have formed and while the operative procedure is simpler.

BLACK, J. F., M. D. **The purse-string suture; its right and wrong application in appendectomy.** (N. Y. State Med. Jour., Aug. 24, 1908.)

Doctor Black in a very able article shows that if a surgeon must use the purse-string suture because of a gangrenous base or other reason which prevents simple tying of the appendix, he should modify the dangerous methods ordinarily used.

He calls attention to the fact that by the usual method employed small "bits" of the peritoneum are taken around the base of the appendix and when the appendix is turned inside out only these small portions of the tissue are constricted by the ligature, and the bulk of the tissues in the wall of the appendix are outside the ligature and no protection is secured from hemorrhage. If the purse string must be used, make four deep "bites" around the base of the appendix, each one taking approximately all of one-quarter of the tissues, and each time reinserting the needle very close to the point where it emerges; this insures constriction of almost all the tissue when the inversion is made and the suture drawn up. The improvement in this method will probably aid in reducing the list of secondary hemorrhage cases which have been from time to time reported as following the use of the so-called "Dawbarn" purse-string suture.

WILLIS, DR. MURAT. **Result of over 100 inquiries sent to well-known American surgeons regarding method of dealing with appendix stumps.** (Annals of Surgery, July, 1908.)

Replies were received from 105 surgeons, and, to sum up briefly, it seems from their replies best to (1) crush and ligate, (2) divide the appendix with knife or scissors (although some used the cautery), (3) to bury the stump after ligation (not by inverting).

The last is the part discussed most thoroughly by the author, and the following reasons are given for burying the stumps: (1) No adhesions form, (2) greater safety (in case of infection or slipping of ligature), (3) very few fistulæ, (4) no greater pain from burying the

stump than from not burying it (this has been proven by Lennander, who shows the absence of visceral peritoneal nerve fibers which convey the sense of pain), (5) the burial of the stump is safer from the standpoint of hemorrhage than the inversion method.

This review would seem to give pretty conclusively the methods used by a majority of our best-known men.

PATHOLOGY AND BACTERIOLOGY.

By Passed Asst. Surgs. C. S. BUTLER and O. J. MINK, U. S. Navy.

QUINBY, W. P. **The demonstration of Treponema pallidum by the method of dark field illumination.** (Boston Med. and Surg. Jour., Aug. 6, 1908.)

The differentiation of *Treponema pallidum* from the organisms which resemble it, *Spirochæta refringens* and *Spirochæta dentium*, is not very difficult. Contrasted with these two spirochætes the treponema is more delicate, harder to stain, its twists are steeper, shorter, and more regular and not so high toward the ends, thus producing a pointed form. Its motions are three—rotation, backward and forward swaying, and bending. The refringens does not bend, the motion of Sp. dentium is principally that of rotation. The pallidum is least refractive of all.

The observation of the motions of Treponema pallidum by means of dark field illumination is a most valuable diagnostic procedure. This has been much simplified by the "paraboloid condenser" of Siedentopf. This appliance reverses the usual microscopic picture giving a black field while interposed objects are luminous and refractile. This is because the only light entering the objective is that thrown into it by bodies denser than their surrounding medium. Motile objects show with great clearness.

The space between the condenser and slide is filled with cedar oil. A dry lens of high power is used in the objective. The light is gotten from an arc or incandescent light of 50 or more candlepower. This light is focussed just in front of the substage mirror by a system of condensing lenses. Thus the distance from light to microscope is made to conform to the limits of the desk.

The method of getting the material (chancre juice, etc.), whatever it be, should insure the getting of treponema if present, and the exclusion of pus, most of the blood cells, and extraneous matter. Beer gives five methods: (1) Wash lesion with salt solution and rub its surface with the platinum loop till serum exudes. (2) Scrape with a sharp curette. (3) Incise and examine serum which flows. (4) Examination of macerated material obtained by excision. (5) Examination of material obtained by puncture of the satellite gland by the hollow needle. Nos. 1, 3, and 5 are best for present mode of

examining. The writer prefers suction with or without previous incision according to lesion. He uses two lengths of glass rod (6 and 12 c. m.) with lumen 2 to 3 m. m. They should be thick and the distal end expanded like a "blunderbuss." A metal syringe of 20 to 30 c. c. capacity with well-fitting piston is used to produce suction. When sufficient material is obtained, the rubber tubing is removed which connects glass rod and syringe, and a few drops of salt solution allowed to flow from a medicine dropper through the glass rod upon the lesion. The serum and salt solution are caught on a glass slide, thoroughly mixed, and examined. The number of treponemata varies according to the nature and age of the lesion. They should not be declared absent until four well-prepared preparations have been examined with negative results. While in secondary lesions they are most numerous, primary lesions show them best the earlier examined. Antiluetic treatment does not change their morphology. Though familiarity with the appearance of treponema in the dark field makes recognition quite certain, it is also advisable to examine stained specimens.—(C. S. B.)

KARCHER and SCHAFFNER. **Adams-Stokes disease with induration in the bundle of Hiss.** (Berliner Klinische Wochenschrift, July 6, as abstracted in the J. A. M. A., Aug. 15.)

These authors describe a case of Adams-Stokes disease with the autopsy findings in which the bundle of Hiss was found to consist of connective tissue through more than half of its substance. The symptoms during life were tachysystole of the auricles, with bradysystole of the ventricles. With a radial and carotid pulse of 33 the jugular pulse was three or four times as rapid. They found in the literature 12 cases of Adams-Stokes disease associated with induration of the bundle of Hiss. Of these, 5 cases showed also interstitial cicatricial tissue at the apex, 1 case in the pericardium, while in the others the bundle of Hiss was the site of syphilitic changes. Other cases examined showed the bundle of Hiss normal in cases showing Adams-Stokes syndrome, while in some cases which did not show the syndrome the bundle of Hiss was degenerated. Notwithstanding, the authors believe that there is a causal relationship between the pathologic changes in the bundle of Hiss and the Adams-Stokes syndrome.—(O. J. M.)

GOMEZ, L. P., S. M. **The anatomy and pathology of the carotid gland.** (Am. Jour. of Med. Sciences, July, 1908.)

The object of the author's work was the determination of the effect of the various systemic diseases on the carotid gland, and also, incidentally, a closer observation of the anatomy and histology.

In the first part of this paper the author describes his technique in making preparations, and the anatomy, embryology, and histology of the gland.

The remainder of the paper contains a description and a discussion of the pathological conditions occurring in the glands. A number of cases of tumors are reported. These consist of a hyperplasia of the cells about the blood vessels, and are spoken of as endothelialomata, as the most accepted embryological view of the origin of the gland is endothelial. The tumors are oval in shape, the size varying from a pigeon egg to a goose egg. They are benign at first, but later grow very rapidly and tend to involve surrounding structures, especially the nerves. In one case the lymphatic glands were involved and in another case metastases were found in the liver. Sclerosis of the carotid gland occurs in old age and also as a result of syphilitic arteriosclerosis of the carotid. The sclerosis always appears to be associated with and in proportion to sclerosis in the intima of the carotid artery.

The gland is not much affected by systemic diseases, one case of cloudy swelling and one of lymphoid infiltration being encountered. Hyaline degeneration of the sclerosed stroma is frequent in old age. The cells of the gland undergo rapid post-mortem change.—(O. J. M.)

MEDICAL ZOOLOGY.

By R. C. Holcomb, U. S. Navy.

Stiles, Ch. W., Chief of Division of Zoology, Hygienic Laboratory. **The common tick (Dermacentor Andersoni) of the Bitter Root Valley.** (Public Health Reports, Vol. XXIII, No. 27, p. 949.)

Doctor Stiles states that after a careful study he is convinced that the tick of the Bitter Root Valley concerned in the transmission of Rocky Mountain spotted fever is a distinct species.

The species with which it is most easily confused are *Dermacentor occidentalis* of California, *D. parumapertus* of California, and *D. venustus* of Texas.

It differs from *D. occidentalis* in having short instead of long dorso-lateral prolongations of the base of the capitulum, and in having a blade-like prominence instead of a prominent spur on the dorso-distal portion of trochanter I.

It differs from *D. parumapertus* and *D. venustus* in form and size of stigmal plate and arrangements of the "goblets."

In the male of *D. andersoni* the dorso-lateral prolongation of the stigmal plate shows a decided tendency to form a right angle with the body of the plate, while in the female it forms an acute angle. Further, the "goblets" are much more numerous and crowded than in either *D. parumapertus* or *D. venustus*.

McCoy, G. W., Passed Assistant Surgeon United States Public Health and Marine-Hospital Service. **Leprosy-like disease in rats.** (Public Health Reports, Vol. XXIII, No. 28, p. 981.)

Doctor McCoy reports 22 cases of leprosy-like disease in rats found in connection with the work of examining rats for the extermination of plague in San Francisco. These 22 cases occurred among 13,500 rats and in the ratio of 1 to 614.

He believes that the disease occurs more frequently than the figures would seem to indicate, as it is possible that the early stages of the disease might escape detection in young rats. All of the cases occurred in the species *Mus decumanus* (now termed in P. H. & M. H. S. reports *Mus norvegicus*), and the majority werein females.

The essential lesion, as described by Doctor McCoy, occurred as a more or less general infiltration of the subcutaneous tissues and the peripheral lymph glands, with an enormous number of fine white or slightly yellowish granules. At times this infiltration forms a general layer, covering the whole surface of the body between the skin and muscular tissues. At other times it is more or less patchy in distribution. This layer of tissue is usually mistaken for fat.

Alopecia is reported as present in 55.5 per cent of the cases, ulceration in 63.5 per cent.

Bacilli were found in the skin, in the lymph nodes, in the discharge from the ulcers, and in one advanced case in lesions of internal organs. The bacilli were acid and alcohol-fast, and were apparently morphologically indistinguishable from the bacillus of Hansen.

McCoy, G. W., Passed Assistant Surgeon Public Health and Marine-Hospital Service. **A report on laboratory work in relation to the examination of rats for plague in San Francisco.** (Public Health Reports, July 24, 1908, p. 105.)

This report is based on the examination of 40,000 rats. Approximately 98 per cent were of the species *Mus norvegicus*, the remaining 2 per cent of the species *Mus rattus*. Of the 40,000 rats examined 85 presented enough evidence to warrant closer examination. Of this number, however, 58 were shown to be infected with plague. Two of these animals were of the species *Mus rattus*, the remainder of *Mus norvegicus*. Of the 58 rats, 39 were sufficiently typical macroscopically and microscopically to warrant a diagnosis without submitting them to the test of inoculation into the guinea pigs. Of the remaining 19 rats, in 14 the macroscopical evidence was stronger than the microscopical, although the disease was proved upon inoculating guinea pigs with the diseased tissues of the rats under suspicion.

VERJBITSKI, D. T. **The part played by insects in the epidemiology of plague.** (Journal of Hygiene, fourth extra number, 1908, pp. 162–208.)

Doctor Verjbitski's experiments were made at Cronstadt and St. Petersburg. Here he found the common flea to be *Typhlopsylla musculi*, which in other localities more commonly infests the mouse. The commonest rat flea in most parts of Europe being the *Ceratophyllus fasciatus* and in India and most subtropical countries the *Pulex cheopis*.

By a series of experiments which are carefully described, Doctor Verjbitski, using the *Pulex irritans* (human flea), *Pulex canis* (dog flea), *Pulex felis* (cat flea), and *Typhlopsylla musculi* (Cronstadt rat flea), came to the following conclusions: First, the rat flea does not bite men; second, human fleas bite rats; third, fleas of dogs and cats bite both men and rats, and fourth, human fleas and fleas of dogs and cats live as parasites on rats.

His experiments in the investigation of the transmission of plague were also conducted using the bedbug (*Cimex lectularius*) and guinea pigs as its host.

He found as a result of his experiments that—

(1) All fleas and bugs which have sucked the blood of animals dying of plague contain plague microbes.

(2) Fleas and bugs which have sucked the blood of animals which are suffering from plague only contain plague microbes when the bites have been inflicted from 12 to 24 hours before the death of the animals—that is, during that period of their illness when their blood contains plague bacilli.

(3) The vitality and virulence of the plague microbes are preserved in these insects.

(4) Plague bacilli may be found in fleas from four to six days after they have sucked the blood of an animal dying with plague. In bugs not previously starved or starved only for a short time (one to seven days) the plague microbes disappear on the third day; in those that have been starved for four to four and a half months, after eight or nine days.

(5) The numbers of plague microbes in the infected fleas and bugs increase during the first few days.

(6) The feces of infected fleas and bugs contain virulent plague microbes as long as they persist in the alimentary canal of these insects.

(7) Animals could not be infected by the bites of fleas and bugs which had been infected by animals whose own infection had been occasioned by a culture of small virulence, notwithstanding the fact that the insects may be found to contain abundant plague microbes.

(8) Fleas and bugs that have fed upon animals which have be infected by cultures of high virulence convey infection by means bites, and the more certainly so the more virulent the culture wi which the first animal was inoculated.

(9) The local inflammatory reaction in animals which have di from plague occasioned by the bites of infected insects is either ve slight or absent. In the latter case it is only by the situation of t primary bubo that one can approximately identify the area throu which the plague infection entered the organism.

(10) Infected fleas communicate the disease to healthy animals f three days after infection. Infected bugs have the power of doi so for five days.

(11) It was not found possible for more than two animals to infected by bites of the same bugs.

(12) Crushing of infected bugs in situ during the process of biti occasioned in the majority of cases infection of the healthy anim with plague.

(13) The injury to the skin occasioned by the bites of fleas or bu offers a channel through which plague microbes can easily enter t body and occasion death from plague.

(14) Crushed infected bugs and fleas and their feces, like oth plague material, can infect through the small punctures of the sk caused by the bites of bugs and fleas, and only for a short time aft the infection of these bites.

(15) In the case of linen and other fabrics soiled by crushi infected fleas and bugs on them, or by the fæces of these insects, t plague microbes can under favorable conditions remain alive an virulent during more than five months.

(16) Chemical disinfectants do not in the ordinary course of appl cation kill plague microbes in infected fleas and bugs.

NOTES ON FLEAS.

Several species of fleas have been found to be the carriers of plagu Verjbitski's experiments were conducted with the *Typhlopsyl musculi*, the *Pulex irritans*, the *Pulex canis*, and the *Pulex felis*. T *Typhlopsylla musculi* he found to be the common rat flea captured rats at Cronstadt. In his experiments with this flea he failed in h efforts to induce it to feed off man and concluded that it did not bi human beings. This flea, it appears, in other localities is more co monly the flea of the mouse (*Mus musculus*). The commonest r flea in most parts of Europe, it appears, is the *Ceratophyllus fasciat* while in India the common rat flea is the *Pulex cheopis*. The repo of Indian plague commission would tend to show that the *M. dec manus* is probably the true host of *Ceratophyllus fasciatus*, while t *M. rattus* is probably the true host of the *Pulex cheopis*. The expe ments which have been carried on by Verjbitski and others sh

beyond any question the power of the *Pulex canis*, *Pulex felis*, and *Pulex irritans* to transmit plague. Before mentioning what hosts these fleas have been found on it would be well to say that the common flea affecting the dog and cat was described by Duges under the name *Pulex canis* in 1832, and by Bouché, under the name *Pulex felis*, in 1835. The reference of the two under one species under the name *Pulex serraticeps* was made by Gervais in 1844.

The *Pulex serraticeps* (*Centocephalus serraticeps*), *Pulex felis*, (*Ctenocephalus enneodus*), *Pulex canis* (*Ctenocephalus novemdentatus*), which is the common dog and cat flea, has been found by the Indian plague commission on the dog, cat, tiger, panther, goat, horse, rat, hedgehog, kangaroo, deer, guinea pig, rabbit, monkey, and man. It however, selects the dog or cat as its host by preference. The *Pulex irritans*, or human flea, was noticed once or twice on the rat and guinea pig. It is seldom noticed on any other host than man. The *Ceratophyllus fasciatus* (*Pulex fasciatus*) was found to be about 2 per cent of the fleas found on the *Mus rattus* in the Punjab during cold weather. This is however the common flea of the *Mus decumanus* in western Europe. The *Pulex cheopis* is the common rat flea of India, both on the *M. rattus* and the *M. decumanus*. The Indian plague commission found this flea on rats (*Mus rattus*, *Mus decumanus*, *Nesokia bengalensis*), muskrats, guinea pigs, cats, rabbits, an Indian antelope, a kangaroo, and on man. With regard to this flea the Indian plague commission came to the following conclusions:

(1) That the guinea pig is as readily chosen by *P. cheopis* for its host as its true host, the rat.

(2) That when many rat fleas are present some of them will attack man even when a rat is available for their food supply.

(3) That when the number of rat fleas is small and when their true host is present they will not attack man.

(4) That when rat fleas are starved they will readily attack all animals, not being particular in their choice of a host.

(5) That rat fleas deprived of food for from seventy-two to ninety-six hours attack and feed on man more readily than at other times.

(6) That rat fleas even when starved prefer their true hosts to man.

(7) That rat fleas may be attracted to man, jump on him, but take some time to feed on him. Plague-infected fleas might in this way be carried from one place to another without infecting the man, but would, when brought near a rat, attack it in preference to man.

BANNERMAN, Lieut. Col. W. B., and KÁPADIÂ, R. J. **Reports on experiments undertaken to discover whether the common domestic animals of India are affected by plague.** (Journal of Hygiene, fourth extra number, 1908.)

The authors, working with pigs, calves, fowls, turkeys, geese, and ducks, endeavored to confirm the experiments of Professor Simpson

in 1902, in which he reported these animals as susceptible to plagu in Hong Kong. (Also see Manson, 4th ed., pp. 272–273.)

Bannerman and Kápadiâ were unable to produce the disease i domestic animals above mentioned, and they cite the experience c the German commission who failed, using doves, cocks, geese, pig sheep, goats, and cows.

Lieutenant Walton, I. M. S., working with the India plague-con mission, failed in attempts to infect pigeons with plague by hypc dermic infection.

In Russia experiments were made to infect with plague pigeon cocks, hens, ducks, crossbills, yellow-hammers, linnets, and canarie but failed.

In Natal, Watkins-Pitchford endeavored to infect hens, pigs, an calves, but failed.

ROBINSON, ALEXANDER, M. B. C. M. **Flies as carriers of contagion in yaws (Framboes Tropica).** (Journal of Tropical Medicine and Hygiene, July 15. 1908, p. 213.)

The fly has been previously suggested as a carrier of yaws by Passe Asst. Surg. Fauntleroy, U. S. Navy. Robinson, of the Gilbert an Ellice Island protectorates, has recently performed some experi ments which would tend to show the fly to be a possible carrier o the contagion. He had a number of his patients in the yaws house of the Tarawa Hospital refrain from washing and medicating thei bodies, so that the flies might have an opportunity of resting on th papules and getting contaminated with the micro-organisms of yaws They were afterwards told to catch the flies thus contaminated and place them in sterile jars provided for this purpose. Some 200 flies were in this manner collected, and were afterwards shaken up with distilled water. Twenty-four hours later 10 c. c. of the water was centrifuged and smears made of the precipitate. Twelve slides were then stained with Giemsa, carbol-fuchsin, or gentian violet in aceto-zone. In all slides examined streptococci, staphylococci, cocci, diplo-cocci, and bacilli were observed. In eight out of twelve slides exam-ined, the chain-like divisional forms of the spirochæte of Castallan were present. In four slides only did he find well-formed example of *Spirochæta pertenuis* of Castellani. Robinson concludes from this experiment that the house fly is capable of carrying the virus o yaws on its body or limbs and should it alight on an abraded surfac of the body of a nonimmune infection would probably follow.

Looss, A., Professor of Parasitology, School of Medicine, Cairo, Egypt. **What is "Schistosomum mansoni?" Sambon, 1907.** (Annals of Tropical Medicine and Parasitology, vol. XI, No. 3, July, 1908, pp. 153–191.)

In this paper Doctor Looss contends that Doctor Sambon has asserted the existence of a new species without sufficient evidence. In dealing with this subject Looss discusses Sambon's classification from a zoölogical, a pathological, and a geographical standpoint.

From the zoölogical viewpoint Looss holds that Doctor Sambon is unable to produce any evidence of a distinctive anatomical character in the adult *Schistosomum mansoni* to warrant its classification as a separate species. He holds that the egg with a lateral spine and the egg with terminal spine were once reported by Bilharz in his early work as present in the uterus of the same female parasite, and that with the absence of any distinctive anatomical difference in the adult the classification of a new species on the ovum alone would hardly meet the approval of zoölogists.

From the pathological standpoint Looss points out that, in his experience, although the lateral spined eggs are never found in the urine the terminal spined as well as the lateral spined eggs have been frequently found in the rectum. He contends that the lateral spined eggs are the eggs of young and immature females and that after impregnation they lay the normal or terminal spined eggs. He bases his theory on the fact that the lateral spined egg is frequently found in the liver and that young females predominate in the portal system. He contends that these eggs of the immature parasites (which have not yet reached the bladder), after reaching the liver get into the biliary system from whence they are taken to the gall bladder. From the gall bladder they are discharged into the intestine and are there mixed with intestinal contents, appearing in the feces. He believes cases observed by Holcomb for a year or more in which the lateral spined egg was always found in the feces, for this reason do not disprove this theory in the slightest. The Bilharzia eggs in any case are not voided by the host within twenty-four or forty-eight hours as is the case with intestinal parasites, but after a long period. He contends that the lateral spined egg is unfertilized, and that the eggs are probably capable of developing by parthenogenesis.

The geographical proof Looss holds is based upon a one-sided interpretation of the literature.

Hamerton, A. E., and Bateman, H. R., Captains Royal Army Medical Corps. **Remarks on the study of biting flies, with special reference to the genus Glossina.** (Journal of the Royal Army Medical Corps, July, 1908, p. 24–44.)

These authors take the *Glossina palpalis* as a type to illustrate the nature of the genus and the technique employed. Quoting Austin,

they described the tsetse as ordinary looking somber-brown or greyish-brown flies, in length from 3½ to 5½ lines, or, roughly speaking, twice the size of the *Stomoxys* (stable or stinging fly), and one-third as large again as the *Hæmatopota*, which are the genera for which they are most apt to be mistaken. In the resting position the identification of the Glossina is easy by the fact that the brownish wings lie closed flat over one another down the back, like the blades of a closed pair of scissors, and extending beyond the last segment of the abdomen, while the proboscis projects horizontally in front of the head. The tsetse fly is confined to the damp, low-lying localities close to water, and roughly speaking it is absent from any district 3,000 feet in altitude. The *Glossinæ* of both sexes are voracious feeders on all vertebrate blood, although by some it is claimed that it is like the mosquito, only a blood sucker by predilection.

The genus *Glossina* differs from the majority of the other genera of the family *Muscidæ* in being viviparous. The pregnant female produces at frequent intervals a single full-grown larva, which is at birth yellow in color and nearly as large as the abdomen of the mother. Immediately after birth the larva creeps about with a good deal of activity, evidently searching for place in which to hide. This mode of reproduction makes it practicable for the female to distribute her larvæ in rapid succession over comparatively wide areas, and not like most diptera exposing her whole family of egg in one place.

The article describes at some length the respiratory, circulatory, alimentary, and reproductive systems of these flies.

The mouth parts of the *Glossina palpalis* are especially described and illustrated with three cuts.

MACKIE, F. P., Captain I. M. S. **A Review of Recent Work on Spirillar Fevers.** (New York Medical Journal, August 22, 1908, p. 337–347.)

This paper with the above title was read at the fifth annual meeting of the American Society of Tropical Medicine, held in Baltimore, March 28, 1908, and is a valuable contribution to the subject of spirillar fevers. Agreeing with the opinion of Professor Novy and others, Mackie believes that the various relapsing fevers are caused by different spirilla, and classifies the spirilla as follows: The European disease, caused by *Spirillum obermeieri;* the African disease, caused by *Spirillum duttoni;* the Asian disease, caused by the *Spirillum carteri*, and the American form of the disease, caused by the *Spirillum novyi*. Pending a decision as to its zoological position the parasite is referred to as "Spirillum," rather than "Spirochæta."

The *Spirillum obermeieri* is described as spiral in shape with a length of from 12 to 45 microns and a breadth of from 0.3 to 0.5 microns. The number of curves varies from 4 to 15 in number. No structure

can be made out even under the highest powers. Koch and Karlinski have described one or more flagella, and quite recently Frænkel has described the presence of peritrichous flagella of extreme tenuity. Provazek and Schellack believe these flagella to be artefacts produced by Zettnow's flagella method. The presence of an undulating membrane is described by Schaudinn and Leishman, but is denied by most observers. The movements of the *Spirillum obermeieri* are described as of three easily distinguished characters: (1) corkscrew, (2) undulatory, and (3) a swaying motion which is the final sign of its vitality. All attempts to cultivate the organism have been unsuccessful. During an attack of the fever they are present in the blood stream at all times from the onset of the fever until the crisis when they promptly disappear. Most observers agree that it is found only in the blood stream and while present it is accompanied with a polymorphonuclear leucocytosis. In laboratory experiments the disease can be transmitted to monkeys only direct from human sources, while it may also be transmitted to mice if the infection is first passed through the monkey. The natural transmission is believed to be through the agency of the bedbug (*Cimex lectularius*) as the spirilla have been found in bugs from infected dwellings and they have been demonstrated in the stomach contents of these insects as late as thirty days after feeding. Immunity, though conferred by an attack, is not very marked, nor does it last long.

The *Spirillum duttoni* is described as being from 13 to 45 microns in length and 0.2 to 0.4 microns in breadth. It has pointed ends and from 2 to 6 undulations. The question of flagella is still controversial. Zettnow describes diffuse peritrichous flagella, but Breine, Kinghorn, Garrett, and Stephens deny either the presence of flagella or an undulating membrane. All writers are unanimous in stating that this spirillum is much less common in human blood than the other spirillum infections and in cases of this infection it is accompanied with a leucocytosis.

Certain species of monkeys (*Cercopithecus, cynocephalus*) are susceptible to infection but the ordinary laboratory animals are not. The natural method of transmission, according to Dutton and Todd, appears to be by means of the bite of the tick *Ornithodorus monbata*. It was shown by Koch that after a few days the spirillæ disappeared from the stomach of the infected tick and were found on the surface of its ovary where they appeared to undergo multiplication. Koch found from 6 to 15 per cent of ticks from infected huts contained the spirilla. Carter found that six out of thirty-two eggs laid by an infected female tick contained the spirilla.

The *Spirillum novyi* is the smallest and most delicate of all the spirilla. It measures from 7 to 9 microns in length with from 2 to 3 short turns, or its length may be a multiple of the length given above, due to end to end union. The movement of this spirillum is said to be similar to the other spirilla, and division is always transverse and never longitudinal. Monkeys, mice, tame and white rats are all susceptible to the American spirillum.

The *Spirillum carteri* is from 12 to 16 microns in length by 0.3 to 0.5 microns wide. Mackie describes a terminal flagellum at one or both ends, but has been unable to demonstrate the presence of an undulating membrane. In the circulatory blood multiplication takes place by transverse division, but in the stomach of a louse (*Pediculus corporis*) Mackie observed appearances which strongly suggested longitudinal division. Cultivation has so far been unsuccessful. This organism is readily found in the blood during the fever and in one experiment previously reported by Mackie, a monkey innoculated with blood of a patient during the apyrexial stage developed the fever on the same date that his patient developed his relapse. Blood taken from the human patient at this same date citrated and preserved in vitro failed to show spirilla. Mackie has shown that monkeys, white mice, white rats, white rabbits, black rats, brown rats, and to a lesser extent guinea pigs, are all susceptible to infection. As to the question of natural transmission the bedbug (*Cimex rotundatus*) and the body louse (*Pediculus corporis*) are possible carriers. In the bedbug spirilla were found regularly up to the 6th day after feeding, but only in the presence of fresh blood in the body louse the spirilla were found not only in the stomach but in the internal organs where they showed evidence of undergoing multiplication.

Mackie, after discussing the Indian type of fever, makes a comparison of the human spirilla and illustrates it with the following table:

Table of comparisons.

	S. obermeieri (European).	S. duttoni (African).	S. novyi (American).	S. cartari (Asian).
Minimal length....	12 microns.....	13 microns.....	7-9 microns.....	12 microns.
Shape.....	Spiral.....	Open flexures.....	Regularly spiral...	Open flexures.
Flagella.....	Peritrichous.....	Peritrichous (?) ...	Terminal (Novy). peritrichous (Fraenkel).	(?)
Animals susceptible	Small rodents only after passage through monkeys.	Small rodents and many animals very susceptible.	Small rodents very susceptible.	Small rodents infected with difficulty.
Course in animals...	Mild.....	Very severe.....	Severe.....	Very mild.

Table of comparisons—Continued.

	S. obermeieri (European).	S. duttoni (African).	S. novyi (American).	S. cartari (Asian)
Course in man.....	One, sometimes two, relapses.	Severe, from four to five relapses.	(?)	Severe, one or two relapses.
Parasite in the blood.	Heavy infection...	Very sparse.....	(?)	Variable.
Natural transmission.	(?)	By ticks.....	(?)	By lice (?).
Serum reactions....	Immune, serum without effect on novyi or duttoni.	Immune, serum without effect on novyi or obermeieri.	Immune. serum without effect on obermeieri, duttoni, or carteri.	Immune, serum without effect on novyi.

The nature of the parasite as to whether it is more closely related to the protozoa or the bacteria is discussed to some extent. Schaudinn threw the weight of his opinion in favor of the protozoal relationship, claiming that the spirochætæ represented the flagellate stage of a sporozoon. He stated that they were closely related to trypanosomes and were possessed of a nucleus, blepharoblast, flagellum, and undulating membrane. In his views he has been supported by Prowazek, Neufeld, and others. Novy, on the other hand, considers that these organisms are more closely related to bacteria in that they are structureless, possess multiple flagella and divide transversely, and denies that they contain a nucleus, blepharoblast, or undulating membrane. The spirilla are very little affected by plasmolytic changes, while this is not the case with trypanosomes. It is pointed out that with a bacterial infection there is usually a polymorphonuclear leucocytosis (malaria, kala-azar).

The article has appended to it an extensive bibliography of recent literature on this subject.

HART, GEORGE H., V. M. D., Assistant in Pathology and Bacteriology, Pathological Division, Bureau of Animal Industry, Department of Agriculture. **Rabies and its increasing prevalence.** (U. S. Department of Agriculture, Bureau of Animal Industry, Circular 129, April, 1908.)

Hart contends that rabies is increasing in the District of Columbia, and states that some 33 proven cases have occurred there during the past year (1907), and that these 33 animals are known to have bitten 16 persons, 46 dogs, 2 horses, and 2 cows. In Chester County, Pa., in 1907, an epidemic occurred necessitating the destruction of 154 dogs, 25 cows, and 10 horses. Since 1903 positive cases have been forwarded to the Government laboratory for examination from Virginia, Maryland, Indian Territory, Indiana, North Carolina, West Virginia, Georgia, New Jersey, Maine, and Wisconsin.

Hart states that the shortest incubation period in the rabbit i six days and is only obtained with "fixed virus," prepared b repeated passage of the ordinary virus through a series of 50 rabbit The incubation period of the disease contracted from the bite of rabid dog is from fifteen to ninety days.

The symptoms of rabies as they occur in the dog are classified i those of the furious and those of the dumb or paralytic type, th latter type being always seen in the terminal stage of the forme The symptoms consist of: (1) Change in disposition; (2) alteratio of voice; (3) inability to swallow; (4) leaving home and returnin in an exhausted and emaciated condition: (5) paralysis of the jaw (6) swallowing abnormal substances, as wood, stone, etc.

Until comparatively recent years the only method of determinin the nature of the disease in the rabid animal was to inject an emul sion of the brain of the suspected animal into a rabbit. Since th work of Negri, of the University of Pavia, Italy, in 1903, a new metho has been furnished investigators. Negri discovered in this diseas certain protozoan-like bodies in the large pyramidal cells of the brain which are now universally known as Negri bodies. These bodies i appears gain entrance at the time of the infective bite and find thei way along the nerve tract. They are most numerous in the larg nerve cells of the hypocampus major.

The Pasteur treatment is the orthodox treatment and is describe at length, giving the location of the better known institutes in thi country.

For the control and prevention of the disease, Hart recommend a national dog-muzzling law.

TROPICAL MEDICINE.

By Surg. E. R. Stitt, U. S. Navy.

British Medical Association (Section of Tropical Diseases). **Liver abscess and ame biasis.** (Journal of Tropical Medicine and Hygiene, August 15, 1908.)

In reporting the papers read at the recent meeting at Sheffiel (July, 1908), it is observed that the subjects discussed by Charles Anderson, Wengon, Rogers, Bose, Hooton, Manson, and Sambon al deal with the important subjects of liver abscess and amebiasis.

Rogers considers that by noting a high leucocyte count with littl or no increase in the percentage of polymorphonuclears we may diag nose the presuppurative stage of liver abscess. He considers that i this is treated with full doses of ipecac abscess formation may b prevented. He also believed that the administration of ipecac as post-operative procedure would give better results in the surgica treatment of such cases. In view of the fact that the mortality fron liver abscess operations in Calcutta was 60 per cent, he rather favore

aspiration as a surgical procedure with the ipecac treatment. He recommended 5-grain pills of ipecac coated with melted salol when the larger doses were contraindicated. He brings forward the point that while surgically it is proper to fully open and drain ordinary abscesses, yet with a condition brought about by a protozoon and which differs materially from a bacterial infection this procedure may not be the proper one.

He indicates that the future may show that aspiration of the pus and irrigation of the cavity with a 1 to 200 solution of a soluble salt of quinine may give the best results. The proper procedure would be to culture the pus obtained from the abscess and, if found bacteriologically sterile, to treat the condition conservatively. If pus organisms are found, then to do a radical operation.

Dr. Koilas Bose, from observations in the Calcutta hospitals, believes that abscess formation only occurs in those whose habits had brought about a susceptibility to hepatic derangement. The idea that this derangement was entirely of alcoholic origin would not hold good, as many cases occurred in total abstainers. He stated that the ipecac treatment frequently seemed to restore patients to health and that it seemed to be capable of relieving pain and stopping the process which gave rise to the fever.

Manson held the view that ipecac exerted a therapeutic influence on amebæ comparable to that of quinine in malaria, and that its effects were marked in dysenteric hepatitis as well as in amebic dysentery.

TODD, J. L. **A review of the position of gland palpation in the diagnosis of human trypanosomiasis.** (Journal of Tropical Medicine and Hygiene, August 1, 1908.)

In this article, the recent literature regarding the value of glandular enlargement and demonstration of trypanosomes in gland juice in the early diagnosis of sleeping sickness, is carefully gone over. It is brought out that the control of the disease by attempting to destroy tsetse flies is impracticable. The removing of infected natives, as evidenced by glandular enlargement, or of the entire native population, from the areas in proximity to streams is considered a practical method in the control of the spread of this disease.

The matter of the transmission of the disease by coitus is taken up and it is considered that such a method of transmission is improbable. It is stated that transmission by mosquitoes of the genera *Stegomyia* and *Mansonia* may account for such infection in the absence of glossina.

The results obtained by French workers in diagnosing the disease is contrasted with that of the British investigators, and the point is brought out that, while at first sight discrepancies may seem to exist,

yet, upon carefully weighing the evidence as set forth in various papers coming from French sources, it is found that the views of those who consider glandular enlargement and the examination of gland juice for trypanosomes, as the important early diagnostic measures, still hold good.

The French apparently had much greater success in establishing diagnosis from examination of blood smears than did the British. It is probable that such success may have been attained by centrifugalizing the blood before making the smears.

As regards the examination of smears from gland juice, it is pointed out that in such material trypanosomes very quickly degenerate, consequently smears should be made and stained immediately.

The French had far greater success in finding trypanosomes in the cerebro-spinal fluid in early cases than was achieved by the English workers.

In connection with gland palpation the following statistics are given:

Of 9,005 apparently healthy natives palpated, 5 showed markedly enlarged glands, and of these 3, as determined by the presence of trypanosomes in the gland juice, were infected. In 36 cases the glands were moderately enlarged; none of these showed infection.

In 1,837 persons the glands could be felt, and of these 297 were examined by gland puncture with negative results. Gland punctures were not made in the remainder of the series.

Quarantine of suspected cases is considered the proper method for the control of the disease.

GENERAL MEDICINE.

By Surg. R. M. Kennedy, U. S. Navy.

Heidingsfield, M. L. **Carbonic acid snow in dermatology.** (Ohio State Medical Journal, May 15, 1908.)

To those interested in this therapeutical agent, the above article is very interesting and instructive. The following is a summary of Heidingsfield's conclusions:

1. Carbon dioxide snow owes its advent as a therapeutic agent to the successful experiments with liquid air, which, because of its expensive, unobtainable, and perishable character, possessed scientific rather than practical value, and spurred the profession to discover a satisfactory substitute.

2. To Pusey, of Chicago, belongs the great credit of the discovery of the practical application of liquid carbonic acid gas in the form of snow.

3. Carbon dioxide snow is generally obtainable, inexpensive, can be indefinitely conserved and its successful application presents no technical difficulties.

4. It possesses the therapeutic properties of liquid air, and can be manipulated with more ease and accuracy.

5. It seems specially well adapted for the removal of vascular and pigmented nevi, tattoo marks and permanent disfigurements of a superficial character, and for the treatment of lupus erythematosus.

6. It seems also well adapted for the treatment of lupus vulgaris, common warts, epitheliomata, and various other cutaneous affections, but the results are still too tentative in character to definitely warrant it to be the method of choice.

7. Carbon dioxide snow commends itself to every dermatologist as a therapeutic agent of unquestioned value and merit, worthy of careful consideration and future study and destined to hold an indispensable place in successful dermatologic practice.

LONGFELLOW, R. C. **Importance of Indican Investigations in Diagnosis and Therapy.** (Ohio State Medical Journal, August 15, 1908.)

Indican is the most important of the normal chromogens of normal urine and is the product of indol generated in the intestine by albuminoid decomposition, which is transformed by oxidation into indoxyl in the blood. This chemic product, acted on and combining with sulphuric acid, is recovered from the urine as potassic or sodic indoxyl sulphate or indican.

Indoxyl, closely related to the conjugate sulphates, is excreted in amounts from 4 to 19.5 mgs. in 1500 c. c. of normal urine in general diet, and is greatly increased in exclusive meat diet or pathologic conditions of the gastro-intestinal canal.

Mineral acids may decompose indican in the urine, the indoxyl being changed by oxidation into indigo blue or red, which under pathologic conditions may appear in the urine as spontaneous solutions or sediments.

The oxidation of indican into indigo blue may occur before the urine is voided, or just after, which is indicated by bluish, green or black color, according to the quantity present.

Bacteria of putrefaction in small or large intestine, as well as the B. coli communis and other types of intestinal bacteria (B. Gaertner specially) play a most important part in the formation of indol, and later indican.

Indican is found in normal urine in larger amounts after a hearty meal of proteids, largely meats, the least quantity being found after milk diet, which reduces the number of intestinal bacteria.

From his studies of indican, the author has gleaned the following facts, which in a general way may be stated as follows:

Excess indicates abnormal decomposition of the proteids and stagnation of peristaltic movements, associated with active intestinal

bacteria; uncomplicated constipation does not increase indican under ordinary diet of proteids.

Indican is increased:

1. In all conditions of the stomach in which digestion is impaired by diminished or lack of hydrochloric acid, absence of pepsin or presence of pepsinogen.

2. In cancer of liver, cirrhosis of liver, lympho-sarcoma, diarrhea, malignant diseases of certain portions of the intestinal canal.

3. In all cases of gastric inflammations, acute and chronic, and atrophic condition of peptic glands or dilated stomach.

4. In intussusception; colon obstruction gives no increase of indican or, at least, only after some days of such obstruction.

5. In cholera infantum (large excess); may be found often in large amounts in urticaria and psoriasis.

6. In protein destruction in fevers, and autointoxication from prolonged influence of the toxins generated and absorbed by the intestines (large excess).

7. In Addison's disease, some anemias, central or peripheral disturbances of nervous system, typhoid fever, pleural exudates, diabetes mellitus (large excess).

Miscellaneous observations concerning indican:

1. As indicanuria is marked in malignant diseases of the ilium and stomach, it is a diagnostic aid of importance in these two conditions.

2. In presence of appendicitis with abscess, and in peritonitis, decrease of indicanuria is favorable; increase unfavorable. In some cases, indicanuria bears close relation to nephritis, pyelitis.

3. Indican in large amount during an attack of pleuritis indicates pathologic exudate; persistence indicates large exudate.

4. If indican is absent or very low in conditions which would favor its production, as under good meat diet, gastric disease, stagnation or jaundice, it will point toward occlusion of pancreatic duct.

5. Very often, indican in large amounts or excess will be found, giving evidence that certain functions are below par, when the physical condition and urine will appear as normal.

6. Estimation of indican is just as important in urine examinations as any other element, and it gives a bird's-eye view of the whole gastro-intestinal tract; a most valuable source of information neglected unless sought.

TAUSSIG, A. E. **X-Ray Treatment of Leukemia.** (Interstate Medical Journal, May, 1908.)

Senn in 1903 reported the first case of leukemia apparently cured by means of the X ray. Reports of similarly successful cases were soon reported in considerable numbers and it was believed that a cure for leukemia had at last been discovered. Unfortunately these sanguine expectations have not proven well founded. One

after another, the cases thought to have been cured, relapsed and finally died, so that it seems established that in the X-ray treatment of leukemia we have only a palliative, never a really curative agent. Nevertheless it is unquestionably our most potent therapeutic method in this disease. Arsenic, in spite of the occasional good results attending its administration can not vie with it for a moment. While large statistics are not obtainable it would seem that in myelogenous leukemia, the X rays exert a favorable influence in about 90 per cent of all cases. Often the improvement is striking. The patient becomes subjectively well, his fever ceases, he gains in weight and strength, the hemoglobin as well as the red and white corpuscle count become normal, the spleen shrinks astonishingly—indeed, the demonstration of a slight splenic tumor and of an occasional myelocyte in the blood may alone serve to remind us that the disease is only latent.

Sooner or later, the inevitable relapse occurs and then the X rays usually prove far less effective than when first administered. The total duration of the disease is still usually less than one year, rarely more than two, but meanwhile the patient, instead of remaining a hopeless invalid, has had months of apparent health. In lymphatic leukemia, the X rays have proven far less effective than in the myelogenous type, though owing to its greater chronicity the average duration of life is still longer in the lymphatic than in the myelogenous form. Usually in lymphatic leukemia the blood remains but slightly affected by the treatment and only those lymph nodes that have been exposed to the direct action of the rays show any tendency to atrophy. Occasionally, however, results have been obtained rivaling those in myelogenous leukemia. At all events, even in lymphatic leukemia, the X-ray treatment deserves a trial.

There is as yet no general agreement regarding the mode of application of the X-ray in leukemia. Some advocate few prolonged exposures, others many shorter ones. Some expose once or twice weekly, others daily. On the whole, however, it may be said that the average course of X-ray treatment for leukemia consists of a total exposure of from 300 to 500 minutes. The distance of the anode from the skin is usually kept at from 20 to 40 centimeters, but occasionally, in refractory cases, it is believed that one is justified in reducing the distance to 10 centimeters, in spite of the increased risk of burns.

CARMAN, R. D. **The Roentgen ray in the diagnosis of renal and ureteral calculi.** (Interstate Medical Journal, May, 1908.)

Carman states that out of a total of 1,093 cases, there were only 12 errors, an error ratio of about 1 per cent. This is quite small and covers a period of imperfect technique and inexperience.

ADVANTAGES OF THE METHOD.

1. The examination is painless. No general or local anæsthetic is required, with the resultant depression and subsequent treatment.

2. It requires very little time, and the dangers of burn are practically nil.

3. It gives the exact location of the stone or stones, whether in the kidney or ureter, and, most important of all, gives the number of stones present.

4. There is no exploratory operation necessary, as far as the detection of calculi are concerned.

5. Calculi bilaterally situated are recognized, and the danger of operating upon the wrong kidney or ureter thus obviated.

6. The negative diagnosis is as acute as the positive when proper care is taken.

Technique.—The patient for X-ray examination of the urinary tract should be given a cathartic several hours before the examination. This is done to eliminate fecal concretions and to minimize the number of exposures. At the time of exposure all clothing is removed from the part to be examined and the patient may then be covered with a thin sheet if necessary. The patient lies upon his back with the shoulders elevated and the knees flexed, thus to bring the kidneys as close to the plate as possible. This is most conveniently done by the aid of pillows and sand bags. Some form of compression is always used to limit the motion of the kidney, due to respiration. This is accomplished either by the abdominal binder, the compression diaphragm, or by instructing the patient to hold the breath. In the first examination two 11 by 14 plates are used. These plates, carefully placed, will give us pictures of the whole urinary tract. Following this examination smaller plates are used with the compression diaphragm to more carefully examine smaller areas successfully.

As more than half of the Roentgen technique depends upon the Crookes tube, it might be well to mention that Carman prefers a heavy self-regulating tube, neither too high nor too low in vacuum. The one he likes best might be called by some a "seasoned tube." With such a tube, a good coil, and a mercury turbine interrupter he is able to get good tissue differentiation, and the exposure may vary from one to five minutes without change of vacuum, or danger to the patient.

The development is best done by the operator. Plates in which calculi are suspected should be developed with a rather dilute developer in order to increase the contrast between soft structures. This will necessarily prolong the time of development, but the results obtained are so satisfactory that the time is well spent.

HYGIENE AND SANITATION.

By Medical Inspector H. G. BEYER, U. S. Navy.

CHICK, H., D. Sc. **An investigation of the laws of disinfection.** (Journal of Hygiene, January, 1908.)

This paper gives a condensed historical review of the endeavors of Pasteur, Koch, Esmarck, and Henle, as well as the more recent investigators Krönig and Paul, to establish by systematic experiments on disease germs definite values of the various disinfectants, such as mercuric chloride, phenol, and the higher homologues of phenol, under fixed and known conditions. The writer has supplemented the findings of these investigations with many elaborate and carefully detailed experiments on similar lines or original modifications of them; employing three classes of disinfectants, viz: (a) Metallic salts, $HgCl_2$ and $AgNO_3$; (b) phenol, and (c) emulsified disinfectants (containing insoluble coal-tar derivatives held in very fine suspension in water by means of soap, glue, etc.), known throughout the paper as disinfectants "A".

The entire subject of research is divided into three sections.

I. *Reaction velocity of disinfection.*

In the experiments under this heading anthrax spores were employed to some extent, but more often the *B. paratyphosus*, on account of its property of fermenting dulcite and glucose. Earlier investigators, Krönig and Paul, had used the "garnet" method: Garnets of equal size, carefully cleaned and dipped into an emulsion of sporing anthrax bacilli, which were allowed to dry on their surface in a thin film, were then subjected to the action of the disinfectants; washed and the washings plated and the results counted.

The writer's method was the use of "disinfectant tubes" to which an emulsion of bacteria or spores was added and the mixture afterwards plated on agar. These experiments led to the following conclusions:

1. When phenol is used as a disinfectant a logarithmic relation exists between its concentration and the time taken for disinfection. * * * This was found to be true in the disinfection both of *B. paratyphosus* and of *Staphyl. pyogenes aureus*.

2. The same relation exists in the case of an emulsified disinfectant and *B. paratyphosus*, but only within narrow limits of concentration.

3. With silver nitrate and *B. paratyphosus* the above logarithmic relation holds good. In the case of mercuric chloride it is also true, if, in place of concentration of mercuric chloride, numbers are inserted representing concentration of Hg^{++} ions. This is shown in the case both of anthrax spores and *B. paratyphosus*. These facts lend further confirmation to the theory that, in the case of disinfection by metallic salts, the metallic ion is the real disinfecting agent.

4. The relation, expressed in 1, between velocity of disinfection and concentration of disinfectant, forms a marked contrast to the simple proportionality obtaining in the

case of a chemical reaction of the unimolecular type, with which otherwise * * * disinfection shows a close analogy.

5. Very small traces of salts of the heavy metals were found to prove inhibitive to bacterial growth. Bacteria which had been immersed in such solutions were therefore treated with sulphides when making test cultures. Large excess of sulphide was found indispensable, and, in the case of mercuric chloride, this is probably needed for the splitting up of some compound between the metal and the substance of the bacterium, which will prevent all further growth, however great dilution with culture medium be employed. If, however, a large excess of sulphide is administered subsequently as an antidote, the bacterium may recover its vitality.

II. *The effect of varying the concentration of a disinfectant upon a germicidal action.*

In these experiments *B. paratyphosus* was mainly employed, although some results were also obtained with *Staphylococcus pyogenes aureus*. The method adopted was that of measuring the time taken for almost complete disinfection of a constant number of bacteria, and led to the following conclusions:

1. Disinfection is a process showing close analogy with a chemical reaction, the disinfectant representing one reagent and the protoplasm of the bacterium the second.

2. It is a gradual process, without any sudden effects, and if the disinfectant is sufficiently dilute to admit of a reasonable time being taken for the process, the reaction velocity can be studied by enumerating the surviving bacteria at successive intervals of time.

3. In the case of disinfection of anthrax spores the reaction proceeds according to the well-known equation for a unimolecular reaction embodying Guldberg and Waage's law. * * * This was the case with values calculated from experiments of—

(*a*) Krönig and Paul, working with mercuric chloride, and using the "garnet" method.

(*b*) Madsen and Nyman, working with mercuric chloride and heat, and using Krönig and Paul's method.

(*c*) The present work, using phenol as disinfectant, a simple emulsion of spores, and the method described in the present work.

4. The process, although really involving two "reagents," follows the law of a unimolecular reaction, because the second reagent, the disinfectant, is present in so great an excess, comparatively, that its concentration may be regarded as unaltered during the process. An interesting analogy is thus offered with the case of the inversion of sugar, which, in reality a dimolecular process, obeys the laws relating to a unimolecular reaction for a similar reason.

5. Experiments with cultures of *B. paratyphosus* show a departure from this simple law, the reaction velocity diminishing during disinfection more rapidly than is accounted for by the fall in number of the surviving bacteria. This was the case with each of the three types of disinfectant used.

This divergence is due to differences in resistance between individuals of the various ages contained in such cultures.

III. *The influence of temperature upon the velocity of disinfection.*

As before the *B. paratyphosus* was employed with a few experiments with anthrax spores. In these operations the method was to

make a comparison of the times taken for (almost) complete disinfection at different temperatures, with the following conclusions:

1. The reaction velocity of disinfection increases with rise of temperature in a manner similar to that of a chemical reaction. * * *

2. The mean reaction velocity of disinfection with metallic salts increases 2—4-fold for a rise in temperature of 10° C. In the case of phenol and the disinfectant "A" the temperature coefficient is much higher, usually between 7 and 8. These experiments were made with about 20—40 million bacteria from a twenty-four hours' culture of *B. paratyphosus.*

3. The value of the temperature coefficient for disinfection of *B. paratyphosus* with phenol was found to vary with the number of individuals disinfected. The younger, and more resistant, individuals possess a higher temperature coefficient than the less resistant forms. The value of the coefficient varied from 2 to 10, according to the nature of the bacteria used for the experiment.

4. Inhibition is also influenced by temperature, but apparently in a different manner, being lessened or increased according as the particular temperature is near to or remote from that of optimum growth for the organism used.

The entire series of experiments led to the following general conclusions:

1. A very complete analogy exists between a chemical reaction and the process of disinfection, one reagent being represented by the disinfectant and the second by the protoplasm of the bacterium.

2. Three classes of disinfectants were studied, (*a*) metallic salts ($HgCl_2$ and $AgNO_3$), (*b*) phenol, and (*c*) emulsified disinfectants (disinfectant "A"). *B. paratyphosus* and spores of *B. anthracis* were chosen as types of vegetative and spore-bearing organisms, respectively.

3. In the case of anthrax spores, the disinfection process proceeds in obedience to the well-known equation for a unimolecular reaction, if numbers expressing "concentration of reacting substance" are replaced by "numbers of surviving bacteria."

4. Experiments with *B. paratyphosus* show a departure from the simple law owing to permanent differences in resistance to disinfectants among the individual organisms. The younger bacteria were proved to be the more resistant.

5. The process of disinfection is influenced by temperature in an orderly manner, and the well-known equation of Arrhenius can be applied.

(*a*) Disinfection of *B. paratyphosus* by metallic salts is influenced by temperature to about the same degree as most chemical reactions, the reaction velocity being increased about threefold for a rise in temperature of 10° C.

(*b*) For disinfection of *B. paratyphosus* by phenol and the disinfectant "A" there was a much higher temperature coefficient, viz, seven to eight. In the case of phenol the effect of temperature was again found to be complicated by the want of uniformity among the individual bacteria. Disinfection of the younger, more resistant bacteria was found to possess a higher temperature coefficient than that of the less resistant forms, the coefficient varying from ten to three or two, according to the age and number of the bacteria disinfected.

6. It follows from (5) that there is a very great advantage in the use of warm solutions for practical disinfection.

7. Experiments made with varying concentrations of disinfectant, and using similar groups of bacteria from cultures of *B. paratyphosus*, showed a definite logarithmic relation, between the concentration of disinfectant and the mean reaction velocity of disinfection, to exist in the case of phenol and the disinfectant "A."

8. In the case of silver nitrate, the same relation existed; but in the case of mercuric chloride, numbers representing concentration of the salt had to be replaced by those representing concentration of the metallic ion. This confirms the theory that in disinfection with metallic salts the metallic ion is the real disinfecting agent.

9. This logarithmic relation is surprising in view of the simple proportionality existing in the case of chemical processes running the course of a unimolecular reaction with which disinfection shows a close analogy.

10. Some evidence was obtained that, in disinfection with mercuric chloride, a toxic compound is formed between the metal and the substance of the bacterial cell. This compound prevents all further growth, but vitality can be restored by the administration of a large excess of soluble sulphide as an antidote.—*Pharmacist P. J. Waldner.*

[Translation by Office of Naval Intelligence, Navy Department, Washington, D. C.]

CIRCULAR NO. 1327.

OFFICE OF ADMINISTRATION,
MINISTRY OF NAVAL AFFAIRS.
Rio de Janeiro, September 26, 1907.

To Chiefs of Divisions and Naval Establishments:

Having in view the maintenance of good health and hygiene on board vessels and establishments of the navy, to prevent the appearance of beri beri, tuberculosis, and other diseases, after consultation with the inspector of naval health, I have resolved to have adopted the following regulations, which I announce to you for these purposes.

Fraternally, ALEXANDRINO FARIA DE ALENCAR.

REGULATIONS TO PREVENT THE APPEARANCE OF BERI BERI, TUBERCULOSIS, AND OTHER DISEASES ON BOARD VESSELS AND ESTABLISHMENTS OF THE NAVY, REFERRED TO IN CIRCULAR NOTICE NO. 1327 OF THIS DATE.

1. Compartments below decks, with the exception of ammunition store rooms, shall have the planking or sheathing coated with varnish or with dry tints.

2. The use of salt water for washing and cleaning compartments of vessels which are not exposed to the open air is expressly forbidden. For cleaning these compartments only fresh water shall be used and in the smallest possible quantities, and they must be thoroughly and carefully dried after the cleaning.

3. The washing of the deck must be carefully done; and when it is not raining, deck, waterways, and scuppers must be thoroughly dried.

4. There must be natural and artificial ventilation passing freely through all compartments of the vessel, and they must be aired daily by opening the hatches, portholes, and scuttles, and by trimming the wind sails.

5. A fire must be kept constantly in one of the boilers for the daily functions of operating the electric illuminating plant, the ventilating system, the distillers, and the circulation of water for sanitary appliances and drainage of bilges.

6. Decks and water-closets of ships shall be disinfected twice daily, at 10.30 a. m., after cleaning, and at 6 p. m., with a solution of creoline or 5 per cent phenic acid. In the bowls of the closets shall be put a concentrated solution of creoline dissolved in fresh water. The disinfecting shall be organized and directed by the surgeon of the vessel or establishment, who shall obtain from the commandant the men and material necessary to carry it out.

7. The different compartments of the vessels as well as bilges and ports shall be kept dry, in order to prevent any trace of dampness manifesting itself in the interior.

8. The surgeons shall accompany the commandant or subordinate officer on the daily tour of inspection, visiting all compartments of the vessels or establishments, and shall

exercise daily the most rigorous sanitary vigilance, communicating to the commandant all irregularities against hygiene.

9. Watch officers shall not allow men to wear wet clothing, especially during the night, or to sleep exposed to the weather, or in damp hammocks.

10. Wet or damp clothing, hammocks, and bags shall be kept on the lines or in the open air until they are thoroughly dry, it being expressly forbidden to make use of or to keep them in wet or imperfectly dried bags.

11. All clothing kept in bags shall be aired at least once a week. All soiled clothing is to be washed every wash day.

12. It is forbidden to paint the clothes bags, which shall be washed on routine days. In addition to the bag for clean clothing there shall be another for soiled clothing, which will be furnished by the ship or establishment, of whose equipment it shall be a part.

13. The nettings and clothing chests shall be aired daily and disinfected at least once a month.

14. On board ship the use of shoes is obligatory only for the sentries, officers of the guard, orderlies, and coxswains of boats and launches.

15. On rainy days the crews of boats, the sentries, lookouts, and men on duty in the open air shall be provided with waterproof clothing, and it shall be forbidden for men to spend the night on deck, with the exception of those on duty while cruising, whenever this shall be necessary.

16. The crew must bathe in fresh water at least three times a week, and in salt water once every day, either overboard or under the shower baths, according to the weather and the temperature.

17. The white uniform is allowed on liberty whenever the weather is good and settled.

18. The inspection of all food for the men shall be rigorously carried out, only such being accepted as is in perfect condition and of prime quality.

19. On vessels those immediately concerned, with their subordinates, shall carefully look out for the cleanliness and good condition of all galley gear, and for the exact quantity and good quality of the food supplied to the men at meal times, using all their efforts to see that the men have good food in accordance with the respective schedules.

20. The water casks shall be emptied and dried at least once a month.

21. The surgeons on board shall inspect the crew two times a month.

22. While cruising, the surgeon must exercise special care concerning the water. In places where there are no water lighters every precaution must be taken to get the water on board in good condition. The water for washing and cooking purposes, and when it is difficult to obtain fresh water, for all purposes, shall be supplied by the distillers.

23. Chiefs and commandants shall take every precaution to maintain the cleanliness, good hygiene, and health of their respective ships, establishments, and crews, requiring of watch officers the greatest scrupulousness in the exercise of the prescribed regulations and the greatest sanitary vigilance on the part of the surgeons and pharmacists.

24. Vessels on which appear cases of beriberi or other diseases of a contagious or epidemic nature shall be immediately disinfected, for which the respective commandants shall take the necessary precautions.

25. Healthy sailors shall be substituted for those who show symptoms of beriberi, tuberculosis, or other contagious diseases.

26. Whenever a vessel is fitting out, or is out of commission for more than a month, it shall be entirely disinfected.

27. Vessels of the first and second classes shall be fitted with Clayton apparatuses for disinfection and ventilation purposes.

28. In the monthly reports of ships and establishments there shall be mentioned the execution of these regulations, as well as those which have not been executed,

with the reason therefor, and there must be mentioned everything referring to sanitary condition of the ship or establishment, with an indication of the provis necessary for ameliorating it.

29. The surgeons of ships and establishments of the Navy must send, monthly, on going out of commission, to the inspector of naval health, special reports on sanitary condition of the respective ships and establishments, and on the hygi measures put in operation during the month or commission, or that it may be neces to adopt, of which the inspector of naval health shall immediately inform the min of marine.

30. The inspector of naval health shall frequently visit the ships, in order to v the results obtained on board with the application of these measures, informing minister monthly of the result of his investigations.

REPORTS AND LETTERS.

A SHORT ACCOUNT OF LEGISLATIVE ACTION REGARDING THE U. S. NAVAL MEDICAL CORPS AND OF HOSPITAL HISTORY.

By Surg. A. FARENHOLT, U. S. Navy.

Legislation by the Continental Congress, looking toward the establishment of a Navy, began by an act passed Friday, October 13, 1775, authorizing the purchase and employment of two vessels, the *Providence* and the *Lexington*, and placing all nautical affairs in the hands of the Marine Committee; this body employed such medical officers as were considered necessary and purchased stores.

On January 6, 1776, Congress first specifically mentioned surgeons by stating, with other officers, their portion of prize money. At this time, and during the first year of our national organization, the pay of a surgeon of a ship of 20 guns and over was $25 per month, 1 ration of $4, and 4 shares of prize money; a surgeon of a vessel carrying 10 to 20 guns received $21 and the same allowances.

The first cruise executed by our public armed vessels was commenced February 17, 1776, from Philadelphia, when Commodore Hopkins sailed with the *Alfred*, *Andrea Doria*, *Columbus*, *Cabot*, *Providence*, *Wasp*, *Hornet*, and *Fly*. It is known that the larger of these vessels carried medical officers. This fleet, returning from the West Indies in May, suffered from a severe outbreak of smallpox, the *Doria* being particularly afflicted. Surgeons were again mentioned in acts of Congress dated July 16, 1777, it being ordered "that the pay and subsistence of surgeons in the Navy be equal to the pay and subsistence of lieutenants of the vessels to which they shall respectively belong." The medical officer is, however, not mentioned again in acts during the war of the Revolution, all matters in this connection being arranged by the Marine Committee or the naval board, as it became later. Surgeons were of course regularly employed and a modest equipment of stores allowed, it being expected and customary for the surgeon himself to supply instruments and articles beyond the necessaries. Surgeon's assistants, called mates, were employed on board the larger vessels as early as 1778. At first they were practically nurses, with no professional attainments, but later corresponded to assistant surgeons, and baymen were detailed from the deck. Few traditions of this early period remain; one

which is preserved may be worth recalling in which, during the memorable action of the *Bon Homme Richard* with the *Serapis*, in the English Channel in 1789, the medical officer rushed on deck and reported to Paul Jones that the water was coming in so fast that the wounded were being floated out of the cockpit. "What!" the latter with characteristic force is supposed to have exclaimed, "would you have me strike to a drop of water, doctor? Here, help me get this gun over."

On March 27, 1794, Congress authorized the building of four ships of 44 guns and two of 36, the former were allowed a complement of surgeon and 1 surgeon's mate and the latter a surgeon alone. The former was to be paid $50 per month and two rations and the latter $30 and the same allowances. The first "acts for the Government of the Navy of the United States" were adopted March 2, 1799; the spirit of these acts, and in many cases the exact wording, was identical with those in force in the Royal navy, and are in themselves the basis of our present "Articles."

Paragraph 15 states that "a convenient place shall be set apart for the sick or hurt men, to which they are to be removed, with their hammocks and bedding, when the surgeon shall advise the same to be necessary, and some of the crew shall be appointed to attend them and keep the place clean; cradles and buckets with covers shall be made for their use if necessary."

Paragraph 16 states: "All ships furnished with fishing tackle being in such places where fish is to be had, the captain is to employ some of the company in fishing. The fish to be daily distributed to such persons as are sick, or upon recovery, provided the surgeon recommends it, and the surplus, by turns, amongst the messes of the officers and seamen, gratis, without any deduction of their allowance of provisions on that account."

Up to this time all American seamen, whether in the merchant service or the Navy, were dependent for hospital care ashore upon either their own exertions or upon charity, and this increasing body of men requiring such relief, Congress, on July 16, 1798, passed an act whereby 20 cents per month was deducted from the wages of each seaman in the merchant marine and this sum disbursed for their interest by a board of directors, who usually designated civil hospitals for this purpose. This act forms the commencement of the Marine Hospital Service. The manner in which this fund was obtained is not surprising when we remember that the only precedent in such matters for Americans was that adopted by the British and which was in general use at that time. As early as 1600 Drake and Hawkins had been instrumental in founding an institution, which later became governmental, called the "Chatham chest;" this was used to provide relief for needy seamen and was maintained by a forced contribution of 2 pence per man per month. It is interesting to note that

at the same time the public sailorman was required to contribute 4 pence per month to the chaplain of the vessel on which he served, which sum constituted almost the entire pay of that officer.

In 1694 Queen Mary, deeply impressed by the suffering of the sick and wounded lately returned from the battle of "La Hogue," granted the unfinished buildings and land known as Charles the Second's palace at Greenwich for a naval hospital and, two years later, a tax of 6 pence per man per month was levied on each person in the naval and in the mercantile service. The original provisions of the Marine-Hospital Service having been found to be of practical utility, an act was passed March 2, 1799, by which the Navy also paid the monthly stipend of 20 cents and received like hospital attention.

The project of a joint public medical department had been agitated for some time, and on the same day, March 2, 1799, Congress passed a bill entitled, "An act to regulate the medical establishment." Section 1 of this bill states, "That in the medical establishment of the United States there shall be the following officers: A physician-general, who shall be charged with the superintendence and direction of all military hospitals, and generally of all medical and chirurgical practice or service concerning the Army or Navy of the United States, and of all persons who shall be employed in and about the same, in camps, garrisons, and hospitals. An apothecary-general and one or more deputies, who shall be charged with the safe-keeping and delivery of all medicines, instruments, dressings and other articles for the use of the hospital and Army. A purveyor, who shall be charged with providing medicines, stores and whatever else may be necessary in relation to the said practice or service. A competent number of hospital surgeons, who shall be liable to serve in the field, and who shall have the immediate charge and direction of all such military hospitals as may be committed to their care, respectively. A suitable number of hospital mates, who are to observe the directions of the hospital surgeons and shall diligently perform all reasonable duties required of them for the recovery of the sick and wounded." The Navy Department, and later the Commissioners, however, attended to matters intimately concerning the Navy to an increasing extent as time went on.

The Navy can not be said to have derived any material benefit from the passage of the act of 1799. So meager were the facilities afforded and of such inadequate character that practically no officers and few enlisted men availed themselves of their right to free hospital attention. In 1810 provision was made at 24 seaport towns for the relief of the sick; only, however, at Boston and at Norfolk had buildings been erected. In New York, Philadelphia, Savannah, and New Orleans arrangements had been made by which patients were transferred to the city hospitals. At certain ports the men were boarded at private houses under contract; at Baltimore, for instance,

the rate allowed was 55 cents per day and at Alexandria $5 pe week. At the navy-yards most frequently used, small quarter were customarily set aside for the use of the sick; such was the cas at Philadelphia and New York. The condition of these buildings wa rarely satisfactory, that at New York was thus described in 1810 b Capt. Isaac Chauncy, the commandant. "Imagine to yourself a old mill, situated upon the margin of a mill pond, where every hig tide flows from 12 to 15 inches upon the lower floor and there deposit a quantity of mud and sediment, and which has no other covering t protect the sick from the inclemency of the season than a commo clapboard outside, without lining or ceiling on the inside. If, si you can figure to yourself such a place, you will have some idea c the situation of the sick on this station." In situations such as thi the chief aim of the victim was usually to obtain sufficient strength t desert.

Secretary of the Navy Paul Hamilton determined to put an end t this unfortunate state of affairs, and February 10, 1810, recommende to Congress the separation of the naval from the Marine-Hospit Service; on February 26, 1811, an act to this end was passed, the 2 cents per month from our men thus becoming the naval hospit fund. A board of commissioners was formed composed of the thre Secretaries—of Navy, War, and of the Treasury. The Secretary c the Navy caused rules and regulations for the government of nav hospitals to be drawn up by a board of four surgeons, but, so pressin were affairs of war and of politics that, unfortunately, more tha twenty years elapsed before any naval hospitals were erected. I the meantime the unsatisfactory makeshifts in quarters in navy-yard were continued.

The Navy pension fund was voted by act of Congress dated Marc 20, 1804. No further Congressional action is to be recorded unt May 24, 1828, when it was ordered that—

1. No person should receive appointment as assistant surgeon until examined an approved by a board of naval surgeons.

2. No person should receive the appointment as surgeon until he had served assistant surgeon at least two years at sea and had been regularly examined.

3. The President might designate and appoint to every fleet and squadron an "e perienced and intelligent surgeon," then in the naval service to act as "surgeon the fleet;" to be allowed double rations while so serving.

4. Assistant surgeons who had been commissioned longer than five years shoul receive $30 per month and two rations. After five years they were entitled to exam nation and if passed were to receive an additional $5 per month and one ration; aft ten years an additional $5 and one ration.

5. Every "present surgeon" should receive $50 per month and two rations; aft five years in grade an additional $5 and ration; after ten years the same further a vance, and after twenty years $70 and three additional rations.

6. Every assistant surgeon after two years' service should while at sea receive doub rations and $5 per month, and every surgeon double rations and $10 per month i addition to his usual compensation.

The unfortunate period of lack of proper care for the naval sick was, in 1832, at an end. The commissioners of the naval pension and hospital funds had failed to work satisfactorily as a board composed of the three Secretaries before mentioned, and July 10, 1832, all accounts were closed and the power vested in the Secretary of the Navy alone as trustee. On this same day Congress appropriated the following sums for the erection of naval hospitals: $26,000 for Charlestown, Mass.; $20,000 for Brooklyn, N. Y., and $30,000 for Pensacola, Fla.

Certain parcels of land had been previously purchased for this purpose at Boston, New York, Philadelphia, and Norfolk. The first of our naval hospitals, as we know them to-day, was built at Philadelphia. In 1811, by the separation of the naval and marine hospital services, it became at once necessary for the Navy to care for its own sick. This was at most yards done by slightly enlarging the quarters previously used for that purpose. At Philadelphia, in 1813, a small frame house was erected at the old navy-yard, in the city itself, and as many patients as possible concentrated there. In 1826, 23 acres, constituting the Abbot home, in the suburbs of that city, were bought, and the "Naval Home," called "Asylum" until 1889, an institution provided for by the act of 1811, was at once commenced and completed in 1832. The purposes of naval hospital and home were both fulfilled by this building, in which also was the commencement of the Naval Academy. The present hospital, a distinct building, was completed in 1868.

The second hospital to be erected was that at Norfolk. The commissioners of naval hospitals first secured the transfer of Craney Island for the site of the Virginia naval hospital, but the following year (1827) abandoned it and arranged for the cession of old Fort Nelson and for the purchase of 25 surrounding acres. On July 17, 1830, the sick were removed to the newly built hospital from the temporary quarters at the yard.

The Chelsea (Boston) hospital was first commissioned January 7, 1836, the ground, originally 115 acres and including much more than at present, was purchased in 1822 for $18,000. Very extensive remodeling was done in 1863. The land on which the present Brooklyn hospital was erected was purchased in May, 1824. It comprised 33 acres of the Schenck farm, and, including the mansion house which for years was used for housing the sick, was valued at $7,600. The front portion was erected in 1838, and was used during the latter part of that year; the two wings were completed in 1840. White marble from Sing Sing was used in its construction. The laboratory, which was originally used as a pesthouse, was also completed in 1840.

The original sick quarters at the Naval Academy was a small two-storied frame building, situated near the fort. In 1853 a brick

structure, the immediate predecessor of the present hospital, was erected at a greater distance from the water and close to the cadet quarters. Although the site of the navy-yard at Portsmouth, N. H., was selected as early as 1800, and the station used for naval purposes, no adequate provision was made for the sick until 1834, in which year a small building, constructed in 1802, was rearranged and assigned to the medical department. Its capacity was 10 beds, but 15 were often crowded into it and at times as many as 25. This small, and later entirely inadequate, building remained in constant use until 1889, when Congress appropriated $43,000 for a new building. Work was at once started, and in December, 1891, the present building was commissioned. The hospital requirements at Washington were first met by the construction of two small frame buildings situated in the navy-yard. In 1843 they were abandoned, and the sick housed in the marine headquarters. In 1861 temporary naval sick quarters were obtained in a portion of the Government Hospital for the Insane, but in March, 1864, $25,000 was given for the construction of a new building, the predecessor of the present institution, on land which had been purchased partly in 1821 and an additional portion in 1864.

The naval hospital at Pensacola was erected in 1875, at a cost of $18,800; it was placed on the site of an old frame structure which had seen service during the civil war.

The navy-yard at Mare Island, Cal., was acquired by the Government January 4, 1853. The original sick quarters, a two-storied frame building, still stands. In 1870 an excellent brick structure was completed, which resembled in plan the hospital at Philadelphia. In 1898 this building was badly wrecked by an earthquake and the present frame building was erected, the cellar and foundations of the former hospital being used in its erection.

INTERNATIONAL CONGRESS OF HYGIENE AND DEMOGRAPHY.

Medical Inspector H. G. Beyer represented the Medical Corps of the United States Navy at this Congress in Berlin, Germany, September 22 to 29, 1907.

After outlining the nature of the organization and giving a brief narrative of the preliminary program and opening formalities, Doctor Beyer continues his report with:

A SHORT REVIEW OF THE WORK OF SECTION VII OF THE CONGRESS.

The distribution and division of the work of this Congress among its eight sections, the regulations of the Congress, laid down in eighteen

different paragraphs, its organization, etc., are all matters of such extensive record, and can be referred to so readily in the printed programmes, that an account of them may well be omitted in this report. The amount of scientific work done in the eight sections during the week of the Congress was indeed so vast, covering, as it did, as completely as had never been attempted before the entire field of hygiene and demography, that no adequate description of it could be given in a brief report. For these reasons I will limit myself to a brief account, merely indicating the work done in Section VII (Military, Naval, and Colonial Hygiene), and which I considered it my duty to attend regularly.

Tuesday, September 24.—Doctor Reder, of Vienna, spoke of the care of the wounded on the battlefield in the Austrian army, and illustrated the operations of the sanitary division in the field by a very large and most elaborately fitted up model. Bischoff, of Berlin, recommended wheeled water-sterilizers which should furnish the men with a good, safe, potable and sufficiently cool water, while Rouget, of Paris, expects the best results from chemical water-purification processes for troops on the march. Dieudonné, of Munchen, recommends from financial reasons the separate system of sewage disposal and prefers it to the mixed system. Sforza, of Rome, looks upon the burning of the cadavers of men and animals, dead of infectious diseases, as one of the principal factors in the hygiene of camps. In the discussion, Mr. Viry, of Marseille, thought the separate system too expensive and the burning of cadavers on the field too inconvenient.

Mr. Hladik, of Vienna, spoke of the occurrence of sickness among large numbers of men caused by foodstuffs, giving an account of a hitherto undescribed form of lead poisoning. Among vegetable foodstuffs he placed poisoning by potatoes at the head.

Doctor Pfuhl, of Berlin, spoke of the many ways in which typhoid bacilli may find their way into barracks. Dieudonné believes that certain ones of the metallic poisons are caused by decompositions, due to bacterial action, and the same was said to be true for potatoes. It was not always due to solanine. In this Doctor Hladik agreed with him.

Professor Wright, of London, becomes honorary president.

Doctor Franz spoke of the relation between tuberculosis of the lungs and functional disturbances in the heart's action, especially as occurring in soldiers. He spoke of the influence of tuberculous lungs upon the development of the organs of circulation. The most frequent cause of an increase in the heart rate was found to be a lowering in blood pressure. Doctor Brann, of Lyons, points to the steady increase of cardiac disturbances in the statistics of the French and German armies and recommends an examination of the lungs to be

made in every case of reported heart trouble. Doctor Schultzen, of Berlin, stated that heart troubles favor the development of pulmonary tuberculosis, except in cases in which congestion of the lungs coexists.

In the discussion, Surgeon-General Stechow, of Berlin, points out the necessity of repeated heart examinations with the Rœntgen apparatus and recommends a simple instrument for that purpose. Lieut. Col. W. B. Leishman, of London, told of the experiments made in the army with typhoid vaccines, and Surgeon-General Musehold gave an account of the results that had been obtained with typhoid vaccinations in the German army in southwest Africa.

In the discussions Messrs. Wright, Pfeiffer, Brieger, Bail, Kolle, Kuhn, Wassermann, and Lion took part.

Wednesday, September 25.—Professor Gaffky speaks of the spread of plague and of its prevention. Doctor Kutscher, of Berlin, reads a paper by Kitasato, whom sickness had prevented from coming to Berlin. Doctor Thompson, of Sydney, points to the flea as the most common vehicle of transmission of plague from rat to man. Doctor Kossel, of Giessen, wishes to see more accurate observations made and recorded with regard to the subject of the distribution and spread of *Mus rattus* in the different ports, since this variety of rat is most frequently concerned with the spread of plague from ship to shore. Doctor Giemsa requests that a more careful watch be kept on dead rats in ships than heretofore and recommends the Hamburg method of destruction of rats by "Generatorgas" as the best.

In the discussion Doctor Bitter, of Cairo, calls attention to the frequency of the occurrence of plague pneumonia in the provinces of upper Egypt and warns against the modern tendency of underestimating the dangers of plague transmission directly from man to man. He attributes to sanitary measures, taken with this end in view, the fact that plague, in upper Egypt, is much rarer than in India.

Doctor Borel, of Havre, states that all ships coming from plague-infected ports to France are fumigated with sulphurous acid gas and that no disadvantageous results have been noticed. Doctor Tjaden, of Bremen, in opposition to Giemsa, of Hamburg, points out that several deaths have occurred from the employment of generator gas and that, furthermore, the gas does not kill fleas. He comes to the conclusion that, in view of the difference in the character of the cargo, we are compelled to use sulphurous acid gas in addition to generator gas. Mr. Teruchi, of Tokyo, agrees with Doctor Bitter, of Cairo, from his experience in Japan.

In the discussion, Doctor Giemsa, while making the closing remarks and referring to the statements of Doctor Tjaden with regard to the effects of generator gas, points out that the cause of the deaths from generator gas, that had occurred, were to be attributed more to the

disregard of the printed rules of conduct by the workmen than to the generator gas itself. Doctor Dirksen makes some important communication of his investigations on the difficult subject of heat regulation and its difficulties during service on board ship and in tropical countries.

Afternoon session.—Medical Inspector Beyer receives the honorary præsidium over the section.

Doctor Ruffer, of Alexandria, calls attention in no uncertain terms, to the dangers attending Musselman pilgrims, owing to the absence in Turkish ports of sanitary stations and of hospitals. He also shows the dangers that threaten the opening of the Hedjaz Railroad. In the discussion, Doctor Markl, of Trieste, wants all sick sailors sent to a hospital, regardless of where the ships come from; he also insists upon all rats being killed, regardless of whether they are plague-infected or not. Doctor Stekoulis, of Constantinople, frankly admits the great and lamentable insufficiency of sanitary provisions in Turkish ports, but states that improvements are under way. He stated that distillery apparatuses had been put up and that the authorities were now engaged in putting up sanitary devices preparatory to the opening of the Hedjaz Railroad.

Doctor Richelot speaks of the necessity of artificial ventilation on warships and enumerates the requirements to be placed on heating plants. Doctor Beyer, in the discussion agrees with him, but wishes greater emphasis laid on the principle of overpressure in artificial ventilation of warships.

Doctor von Bunge, of Kronstadt, speaks in brief on the principles of combating infectious diseases on board ship.

Doctor Sannemann, of Hamburg, wishes that artificial ventilation be installed in merchant ships to a greater extent than heretofore. Doctor Wagner, of Vienna, speaks of the advantages and disadvantages of heating arrangements on board of ships and closes by giving a number of important requirements to be placed on heating plants. Doctor Dirksen speaks of lavatories, bathing places, and latrines on board ship. The session closes for the day.

Thursday, September 26.—The entire forenoon of the day was taken up by the plenary session, taking place in the large session hall of the Reichstags Building, Prince Heinrich zu Schönaich Carolath presiding. The Prince began by reading (1) a telegram received from the Emperor and (2) a telegram received from the Empress. Several other telegrams were then read, after which the regular programme was begun: (1) The serotherapy of typhoid fever, by Prof. Dr. Chautemesse, of Paris. Doctor Chautemesse declares himself satisfied with the results of his serum treatment of typhoid fever patients. (2) Some recent investigations on the hygiene of subterranean and subaqueous work, by Doctor Haldane, of Oxford. His investigations

would show that it is possible that the dangers connected with the work of this character may be met successfully by further study and further improvements in the technique. (3) The fundamental principles upon which to base a judgment of the quality of a water by Prof. Dr. Schottenfroh. The speaker closed with the recommendation for making the principles upon which a water is judged a matter to be determined by an international commission.

Doctors Reynaud, of Marseilles; Steudel, of Berlin; and Davies, of London, spoke on how to judge the fitness of officers and men for active service in the Tropics, on which subject a written discussion was handed in to the secretary by myself. Doctors Kermorgant, of Paris; Kuelz-Mundame, of Kamerun; and Ziemann, of Charlottenburg, discussed the subject of vaccination against smallpox in the colonies. Doctors Kohlbrügge, of Utrecht; Pannwitz, of Charlottenburg; Plehn, of Berlin; and Sandwith, of London, spoke of sanatoria in the Tropics. Doctor Fülleborn gave a splendid demonstration on the screen showing the way which filaria were introduced into the skin through the stings of mosquitoes.

Friday, September 27.—Session began at 9 p. m. Doctor Ronald Ross speaks of malaria and of the methods for its prevention. He wants the entire work of stamping out malaria placed under a commission. Doctor Ronald Ross receives the honorary præsidium and calls on Doctor Galli-Valerio, of Lausanne, to continue the subject. Galli-Valerio insists upon the employment of more than one method in stamping out malaria and mentions several of them: (1) We must destroy the malarial parasites in man. (2) We must immunize the well against these protozoa. (3) We must protect the healthy as well as the malarial from stings of mosquitoes. (4) We must annihilate the Anophelinae. (5) We must fight the causes that predispose to malaria. Doctor Celli, of Palermo, limits his remarks to malaria as it occurs in Italy, and points to quinine as the best remedy against it. He wants quinine furnished by the Government in the form of easily digested tablets, made with chocolate, and at moderate prices. It is one of the results of his long experience that quinine alone can be made sufficient for stamping out malaria in the most unhealthy districts, when handled properly.

Doctor Celli receives the honorary præsidium after finishing his paper.

Doctor Savas, of Athens, speaks of the measures to be taken for the stamping out of malaria in Greece and recommends that the public receive instruction with regard to the nature of the disease—that the towns be properly drained and that the sale of quinine be assumed by the Government. Doctor Ruge agrees with Doctor Savas, and states that malarial campaigns have so far not been completely successful in the Tropics because (1) the physicians

there are overworked and (2) a good quality of quinine, at reasonable prices, can not be had.

In the discussion Galli-Valerio, of Lausanne; Ross, of Liverpool; Agramonte, of Habana; Beyer, United States; Diesing, of Baden, took part. Doctor Diesing gave the results of his experience with the employment of sulphur against malaria in countries in which quinine could not be obtained or in the case of patients that could not take it. Doctor Ziemann wishes the section to pass a resolution, favoring a more centralized operation against malaria in the colonies and a larger sphere of influence of physicians in the carrying out of governmental measures taken against malaria. Doctor von Celebrini points out the necessity of pure quinine and speaks highly of the recommendation of Celli of administering quinine in the form of tablets of chocolate. The different resolutions are unanimously passed by the section and Doctor Raptscherski receives the honorary præsidium.

Doctor Nocht presents the following resolution:

In view of the increasing importance of tropical medicine and hygiene, the undersigned request that section VII ask the permanent committee of the congress to form a separate section for tropical medicine and hygiene at future international congresses. (Signed) Ruge, Savas, Ross, Galli-Valerio, Celli, Nocht.

This resolution is adopted by the section.

Doctors Agramonte and Otto read their respective papers on yellow fever, which bring nothing that is new to the subject. Doctor Moore speaks of the cytolagy of trypanosomes, during which he appears to have given the blepharoblast the function of a centrosome.

ASSOCIATION OF MILITARY SURGEONS.

Medical Director M. H. Simons represented the Medical Corps of the United States Navy at the meeting of this association, which was held at the Jamestown Exposition, Norfolk, Va., October 15 to 18, 1907. After an introduction paragraph, Doctor Simons reported as follows: The first formal meeting was held about 10 a. m., October 15. The foreign delegates present were from England, among which were included representatives of the Canadian and Indian army medical services, from Mexico, Italy, China, and Guatamala. No foreign naval delegates were sent. These were all made corresponding members in an able and felicitous series of remarks by the secretary. The insignia of the order was not presented this year to foreign delegates as, by order of the association, the custom has been discontinued. * * * The Enno-Sander prize medal was awarded to Major Lynch, surgeon, U. S. Army, for a well-digested scheme of organization of the Red Cross and of the relation it should

bear to the regular forces in time of war. The representatives of the exposition were unavoidably absent, so no address of welcome was made. The annual address of the president of the association, Col. Valery Havard, U. S. Army, on the Ideal Medical Department in the Field, was able and scholarly, and predicted that eventually all matters of camp sanitation, transportation of sick, and other matters pertaining to the health of soldiers will eventually be placed in the hands solely of the Medical Corps.

The first paper presented was by Medical Director Wise, U. S. Navy, on the hospital ship, and the desirability of having it with the fleet was thoroughly demonstrated.

Major Leishman, of the English army, spoke briefly of the effects of the serum vaccine now being perfected in England, though it has been in use several years for protection against typhoid (enteric) fever. Two injections are necessary, under the skin, and the immunity conferred lasts about two years, supposedly. In a regiment, partly inoculated, 2 cases of enteric fever occurred among the 400 men inoculated, and these two had refused the second injection, and 60 cases among the 600 unvaccinated. There is apt to be some little disturbance following the injection of the fluid; but the temperature rarely rises above 2°, and generally there is no rise. The full report of the royal commission on the preparation of the serum, its effects, method of using, etc., will soon be published.

The paper by Maj. H. A. Arnold, National Guard, Pennsylvania, showed that, in temporary camps, garbage and kitchen refuse can be effectively and cheaply incinerated in a trench built under the camp spider. The trench should be over 2 feet deep, sloping slightly to the front, lined with stones or brick, and the fire pot should be covered in the same manner. The trench should also be slightly narrower at the back end. After the cooking is finished the fire is kept up and the garbage, solid and fluid, is thrown in, and soon dries, or drains and burns.

The Sanitation of Modern Military Camps was presented in an able paper by Maj. C. E. Woodruff, U. S. Army, who is the chief surgeon at Camp John Smith in the exposition grounds. He stated briefly the difficulties with which he had had to contend in the sanitation of the camp—typhoid fever was present among the families of people living adjacent to the camp, malarial fever was notoriously common, and flies and mosquitoes swarmed; the ground was low and swampy. The ground was drained, sewers installed for the carrying off of water, drains dug, tents screened and floored, shower baths put in, also tubs for laundry work; the baths and tubs were connected with the sewers which emptied in a creek; kitchen water was thrown into these sewers also. For the disposal of fecal matter and urine the McCall

incinerator is used. This consists of an iron box with a wooden cover in which are two closet seats; the box is about 4 by 3 by 3 feet (exact dimensions not remembered); midway of the depth are two iron shutters, which are open when the closet is in use and closed when incineration is taking place. The fire is laid with wood and the closet used for twenty-four hours; the wooden cover is then removed, the shutters closed, and the fire lighted; a charcoal fire is started first in the back and as soon as this part is well heated the main fire is lighted under the whole furnace. After the shutters are well heated the urine is turned on from the urinal tanks and is speedily evaporated. The incinerators are arranged on a circular brick or stone platform, in groups of two, two incinerators to the group; at the back and connected with the fire place by pipes with valves are two urinals, consisting of a square iron box holding a can which can be removed and cleaned. An iron ventilating pipe runs from each box into the smoke stack. From the center of the platform rises an iron smoke stack about 15 feet high which insures draft and the carrying off of odors. After the excreta are burned the furnaces are cleaned and the fires relaid. Four sets of two each of these incinerators serve for a batallion. The garbage of the camp is hauled outside about half a mile and burned in three styles of incinerators. The ordinary, which consists of a circular pit about 15 feet in diameter by 4 deep, lined with stone or brick and cement, and having a large cone some 6 or 7 feet high in the center, to insure ventilation; a fire is made in about one-third of the circle, of wood laid griddle wise, and when the wood is thoroughly ablaze the garbage, solid, and fluid, is thrown in. A second form is a small pit, like that described in Major Arnold's paper, and a third is a portable iron furnace, the Conolly incinerator. The last two require less fuel than the first.

The tents for men, for cooking and for storing, are carefully screened to keep out flies and mosquitoes; trenches are dug around the tents and gutters along the streets; the stables are placed some distance from the tents, carefully trenched and cleaned; urinal cans are placed near the tents at night; garbage cans for dry and wet garbage are also provided; shower baths and laundry tubs are provided, and connected with sewer pipes. It is found that a blue covering for the tents lessens the heat, and ventilating holes under the fly insure a steady flow of air. Doctor Woodruff thinks that only a dispensary tent should accompany the men, and the sick should immediately be sent to base hospitals.

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A paper on Tea versus Coffee was presented by Mr. G. F. Mitchell. This poined out the many advantages of tea over coffee in the field and camp—it is lighter, less disturbing to the digestion, insures the

boiling of water, can be used cold, etc. Tea is better used with milk, which unites with the tannin forming an insoluble unirritating compound. Fine tea can be grown in the United States, but the high cost of labor, as compared with China and Japan, limits the market. A paper by Doctor Corbusier dealt with the effects of the sun and of artificial heat, showing the difference and pointing out that the effects of the actinic rays of the sun can be almost eliminated by wearing an orange lining to hats and coats. There was not time to finish an interesting paper on Psychic Phenomena of Intestinal Toxæmias, by Capt. J. C. DeVries, National Guard, New York.

Plague in India was treated in a paper by Maj. Arthur Henry Moorhead, I. M. S. In this it was shown that plague is generally conveyed by fleas from infected rats; as soon as a rat dies the fleas leave the body, and, being hungry, will bite any animal they find. Fleas from different animals differ somewhat, but, so far as is known, all varieties, except that from the cat, will carry the virus of plague. The death rate in India is appalling and increasing. The methods of dealing with it are segregation, fumigation with various substances, especially with those that will kill both rats and fleas, cleanliness, removing of roofs to admit sunlight, etc. The intestinal form often remains dormant for a long time in the rat, and then becomes active, which probably accounts for unexpected outbreaks in various localities. Plague apparantly originally was brought in from China.

Dr. Anita Newcomb McGee read a paper dealing with the army canteen, in which she pointed out that the various reports from the War Department and from officers did not bear out the contention that alcoholism and venereal diseases had increased in the Army since the abolition of the canteen, but the reverse; also that alcoholism was greatly more prevalent in our Army and Navy than in either the English or continental armies and navies.

The surgical treatment of chronic dysentery, especially the amœbic, was set forth in a paper by Dr. J. M. Holt, Public Health and Marine Hospital Service. He had found it very successful and recommended attaching the appendix to the abdominal wall and flushing the bowel thoroughly through that, exercising great care as to pressure on the inflamed and thinned gut. The treatment generally requires a year or more and no trouble has been found in the repair of the wound in the appendix or in the abdomen. Selected cases give most excellent results.

The Correspondence School as a Means of Instruction for Medical Officers of the State Forces was treated in a most valuable paper by Dr. H. I. Jones, Indiana National Guard. The method was adopted by Doctor Jones last February, and also with it a similar means for the instruction of sanitary sergeants. Great improvement was noted

as a result in the last encampment. The course will be amplified and the medical officers will be required to show that they have studied the books provided and have carried out in the camps the knowledge thus gained.

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SIXTH INTERNATIONAL DERMATOLOGICAL CONGRESS.

Medical Director G. E. H. Harmon represented the Medical Corps of the United States Navy at the congress, which met at the Academy of Medicine in New York, N. Y., on September 9, 1907. Doctor Harmon reports as follows:

The number of delegates in attendance, foreign and domestic, was large, comprising some of the most eminent dermatologists of Great Britain, France, Germany, Austria, Italy, Spain, and Portugal in Europe; Japan, Australia, Brazil, and Mexico, with representatives from all parts of our own country, including the Hawaiian Islands.

Dr. James C. White, of Boston, was president of the congress, with a number of honorary presidents and vice-presidents selected from among the visiting foreign delegates. Dr. John A. Fordyce, of New York City, was elected secretary-general.

The first morning session was devoted to organization and to addresses of hospitable welcome to the congress upon this occasion of its first meeting in this country. The first address, for the United States Government, was made by Surg. Gen. P. M. Rixey, U. S. Navy, representing the President of the United States, in which, besides fitting and gracefully expressed words of welcome to the distinguished body of medical scientists from abroad, the congress was assured of the deep interest, the earnest appreciation and the ready encouragement which President Roosevelt has ever displayed toward the advancement of medical science.

Other addresses of welcome were made: For the American universities by President Ira Remsen, of Johns Hopkins University; for the medical profession of the United States by Dr. Joseph D. Bryant, president of the American Medical Association, and the morning's proceedings were concluded by an able address by the president of the congress.

The afternoon session of Monday was largely devoted to the reading of papers upon leprosy, lupus and diagnostic points in certain other varieties of dermatoses.

Tuesday, September 10.—Meeting at 9 o'clock; two hours were devoted to the exhibition of patients, with discussions upon the same. This was followed by papers upon a variety of subjects, two of them by Prof. W. T. Councilman, of Boston, and Prof. Gary N. Calkins, of

New York, upon the parasitic organism, cytoryctes variolæ, believed to be the cause of smallpox, and one by Dr. Arthur Whitfield, of London, upon the Opsonic method in skin diseases.

Wednesday, September 11.—A morning session was devoted to about the same programme as the previous day.

Thursday, September 12.—Exhibition and discussion of patients from 9 to 11, and a number of important papers upon the application of Roentgen rays and radium to the treatment of diseases of the skin. Tropical diseases of the skin was the subject of the afternoon work, upon which papers were presented as follows:

The Relation of the Navy to the Study of Tropical Diseases, by Surg. Gen. P. M. Rixey, U. S. Navy (which was read by me in the absence of the Surgeon-General).

Report upon Tropical Diseases of the Skin, by Dr. William Dubreuilh, of Bordeaux.

Some American Parasites of the Skin, by Dr. Charles Wardell Stiles, United States Public Health and Marine-Hospital Service.

The Clinical Grouping of Tropical Ulcers of the Philippines, with some Negative Notes as to Etiology and Treatment, by Dr. E. R. Stitt, U. S. Navy.

Additional Notes on Gangosa, by Dr. O. J. Mink and Dr. N. T. McLean, U. S. Navy, and a paper on Filariasis, by Dr. T. Tanaka, of Tokyo, Japan.

Friday, September 13.—The papers this day, of which there were a number of most interesting character, were nearly all upon the subject of syphilis. The Possibility of Immunization against Syphilis, by Prof. A. Neisser, of Breslau.

Reports on the Present Status of our Knowledge of the Parasitology of Syphilis, by Prof. Erich Hoffmann and Dr. A. Buschke, of Berlin; Dr. Oscar T. Schultz, of Cleveland; Doctors Hallopeau and Gaston, of Paris; by Dr. Max von Niessen, of Wiesbaden; Drs. Robert W. Tyler and Martin W. Ware and George K. Swinburne, of New York; Prof. S. Ehrmann, of Vienna, and others.

Saturday, September 14.—Several papers upon general dermatological subjects were presented, and after a farewell address the congress adjourned finally at noon.

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